29th Annual INCOSE international symposium

Orlando, FL, USA

July 20 - 25, 2019

Nina Marie Sjøkvist

Eliciting Human Values by Applying Design Thinking Techniques in Systems Engineering

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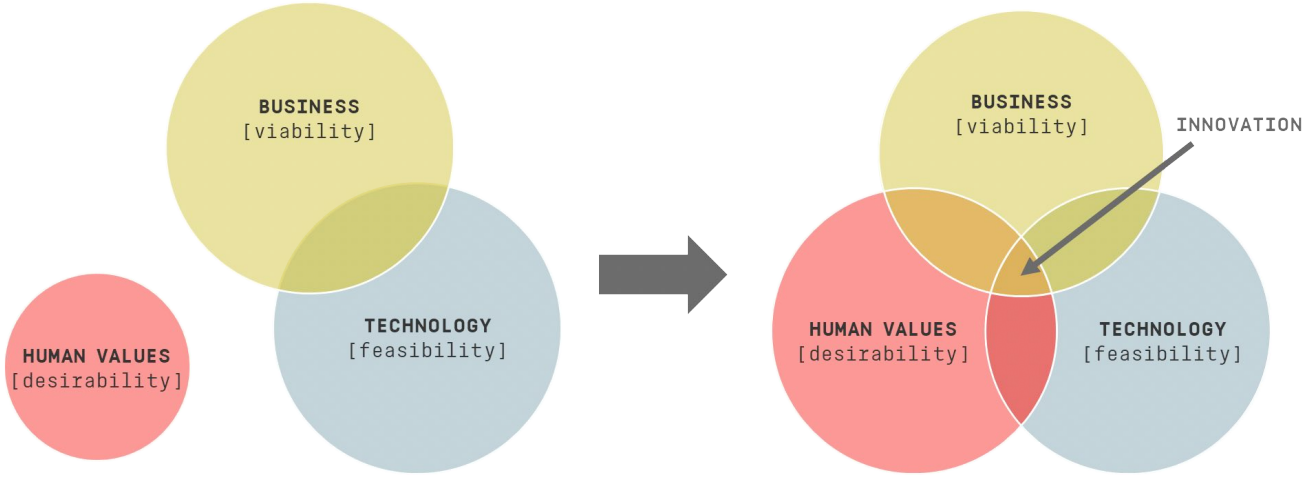
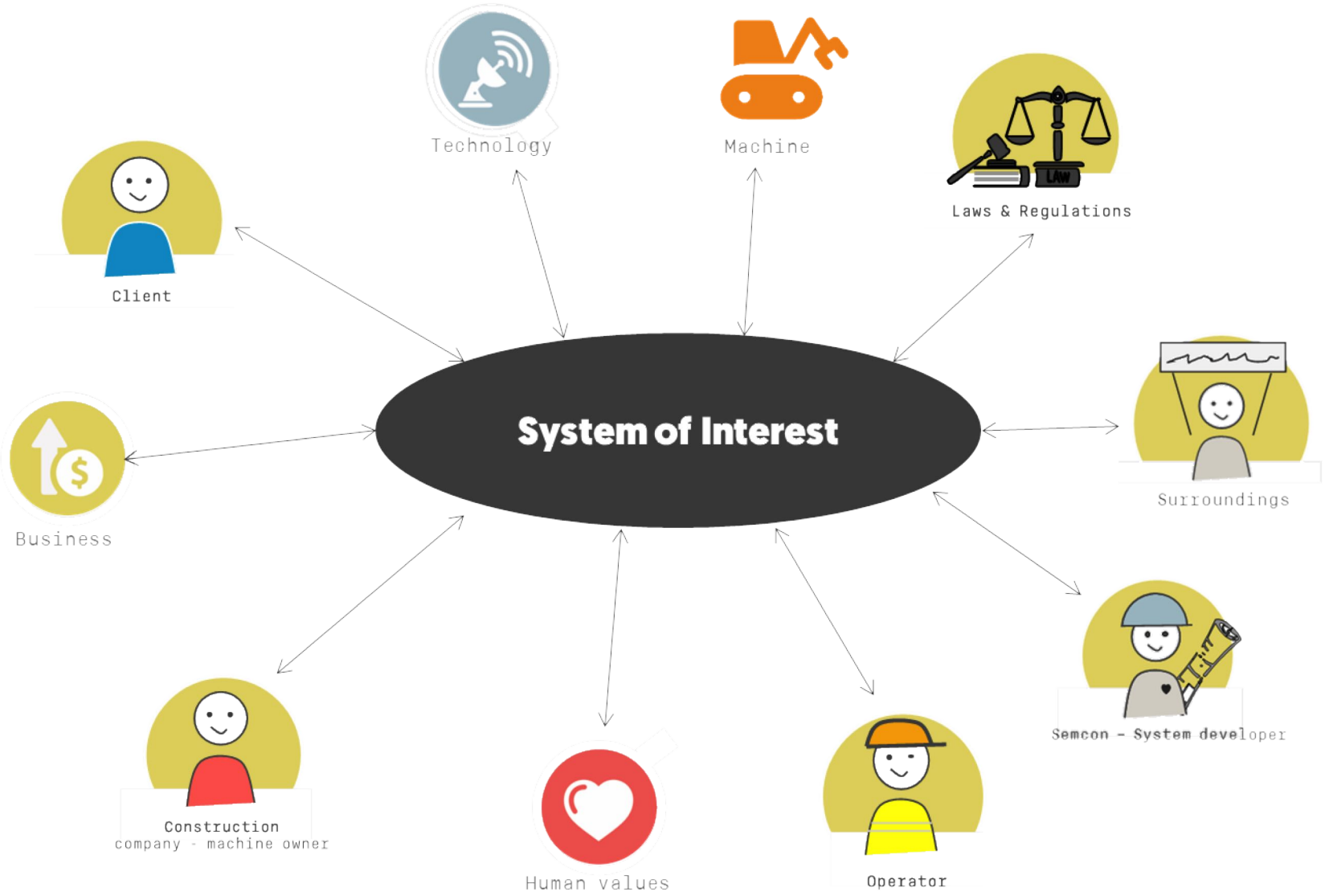
Introduction

- Investigate a method for capturing and communicating human values in the early phase of Systems Engineering projects
- Study the effect of applying Design Thinking techniques in a development project, to capture and understand human values
- Derive stakeholder requirements from the need analysis that satisfies the emotional needs of stakeholders.



Industrial Case

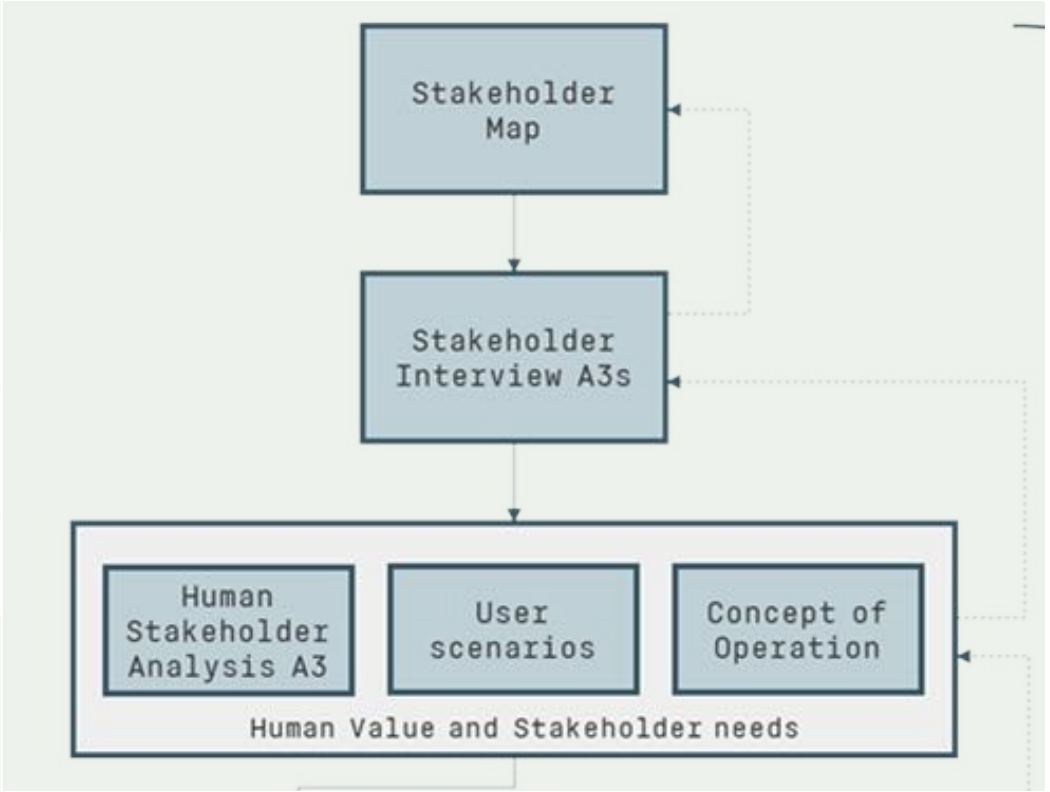


Claim

A systematic approach for interviewing and observing the stakeholders in order to capture emotional needs will make the SE able to include human values in the stakeholder needs and requirements.

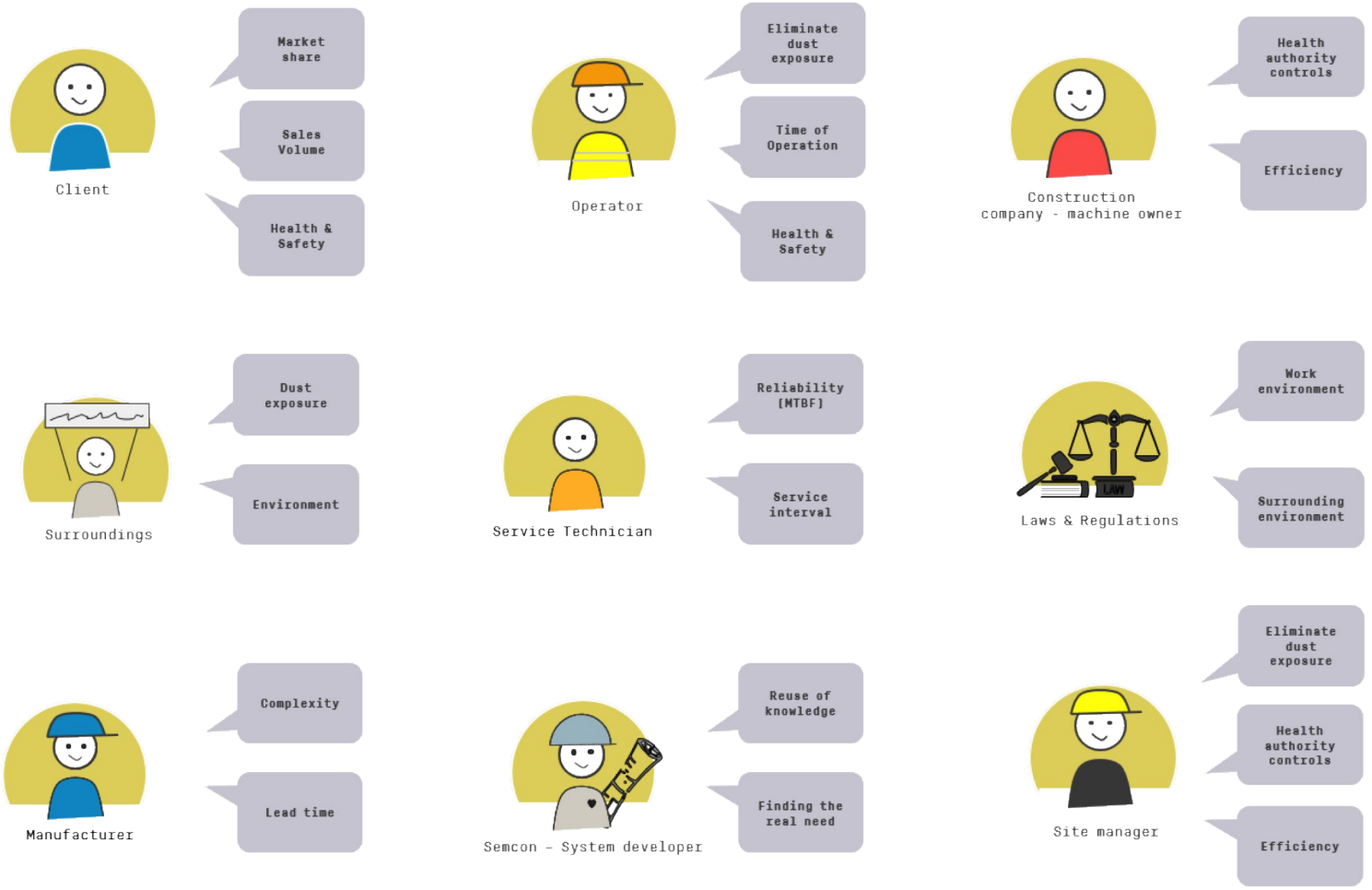

Human-centered
Visual mapping
Sharing knowledge
Iterations
Design Thinking in Systems Engineering
BUSINESS
HUMAN FACTORS
TECHNOLOGY
SE-framework
Diverge - Converge
Concepts
Observe
Engage
Personas

Understanding and communicating human values

Activity	Human Value Output
Identify stakeholders	
Observe stakeholders in their environment	
Interview stakeholders	
Understand stakeholder need	

Understanding and communicating human values

Identify stakeholders



Understanding and communicating human values

Observe stakeholders in their environment

Operator «Joachim»

Profile

Who is the stakeholder?
Is it a primary, secondary or external one?

- Joachim , worked in construction industry 10 years.
- Works in a medium sized company
- Currently working in a road construction project in Kongsberg
- Aware of the health issues the dust is causing, but do not think that much about it in the daily
- He is a primary and active stakeholder

Role and responsibilities

What is the stakeholder role?
What are their responsibilities?

- Perform operation according to plan provided by manager
- Responsible for performing safe operation.
- Responsible for the daily maintenance of his machine, and to hand it over in proper condition to next shift
- Required to apply available dust system when operating in urban area

Interview stakeholders

Tasks

- Start up and check machine and work area
- Operate machine according to the work plan provided from the site manager.
- Daily maintenance on machine:
  - Fill / replace consumables
  - Clean

Pains

- Current system requires too much time beside operation. Avoids to use it when HSE inspectors are not present.
- System has a weak fan which is reliant on the RPM of the diesel motor.
- The system seem cheap and does not last very long
- The service personnel are often unavailable. It often takes more than one week when unplanned service and repairs are needed.

Gains

- The machine has a high up-time.
- Easy to control the machine with remote .
- Easy to do the 250 hour services yourself.

Understanding and communicating human values

Understand stakeholder need

Human Stakeholder Analysis - Operator

Profile

Who is the stakeholder?
Is it a primary, secondary or external one?

The operator is performing the construction work from the cabin or outside, where he is exposed to emissions from machine.
Any additional tasks required from the operator will impact his productivity.
The operator is an active, primary stakeholder.

Operator

Interviews: "Joachim" "Magnus" "Erik"

Role and responsibilities

What is the stakeholder role?
What are their responsibilities?

The operator is responsible for operating the construction machine and develop the construction area according to plan provided by the site manager

- Plan daily work
- Construction work
- Control machine w/ remote control or in cabin
- Daily maintenance

Main Interests

Desirability

*How will the system be **perceived** by the stakeholder?*

- The operator expects to experience a robust and reliable system
- The system should be easy to operate with brief training.
- The operator wants to spend as much time as possible on the main operation, other tasks are considered inconvenient.

Viability

*How will the system generate **value** (what value?) to the stakeholder?*

- Productivity - effective production time
- Operational reliability - down time critical for economy

Capability

*What are the interests related to the **functions & performance** of the system?*

- The operator must be able to perform his tasks without being exposed to health hazardous emissions.
- The dust system needs to work without extra effort from the operator
- Safe working environment

Findings

Project participants experience the stakeholder interviews and observation as effective activities for understanding the needs of stakeholders.

Findings

Pre-defined templates make it easier for the engineers to communicate. Templates should work as a guide, rather than a limitation for what to present.

Findings

Conducting multiple field visit facilitates a better understanding of the problem and its context.

Findings

Access to human stakeholders varies from project to project. How to communicate to our client the value of engaging with real stakeholders?

Findings

Continuous communication is key – include the client in the journey.

Conclusion

The method resulted in nine requirements, addressing humans in terms of usability, and three requirements specifying human values. The initial client specification included seven requirements for usability, and one for visual branding

Conclusion

The method created awareness of human values among the team members in the project.

Future research

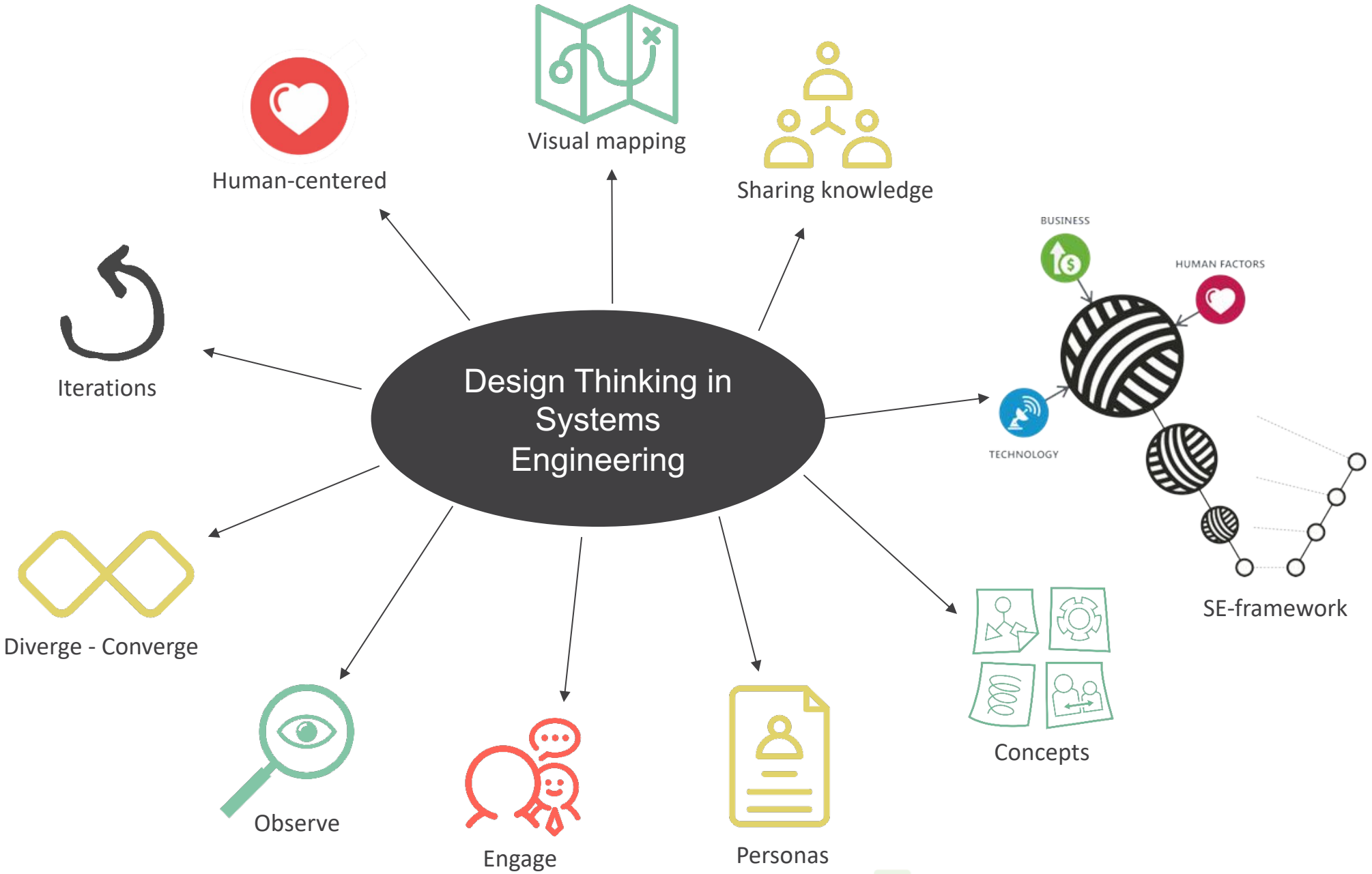
Investigate further the effectiveness of Human Stakeholder Analysis A3s as a tool for deriving stakeholder requirements.

Future research

A method to improve the quality of requirements for human values, including how to validate such requirements.

Future research

How to ensure that human values become visible when designing the system, and included in system requirements and detail design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Thank you.

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