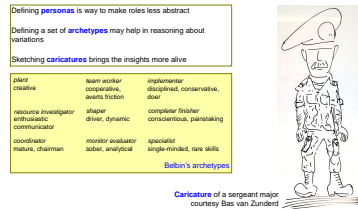


Stakeholders, from Abstract to Individual Humans

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Gerrit Muller

USN-SE

Hasbergsvei 36 P.O. Box 235, NO-3603 Kongsberg Norway

gaudisite@gmail.com

Abstract

Systems engineering uses the term stakeholders very often. This presentation explores the concept of stakeholders. We look at abstractions that we make as well as the relation to real human beings, from flesh and blood, with their emotions, beliefs, and behavior.

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1 Introduction to Stakeholders from abstract to humans

Any system of interest is interacting with its context. We distinguish several elements in the context:

- humans and organizations
- natural environment
- man-made artifacts

Figure 1 shows that all these elements interact within itself between them, and with the system of interest

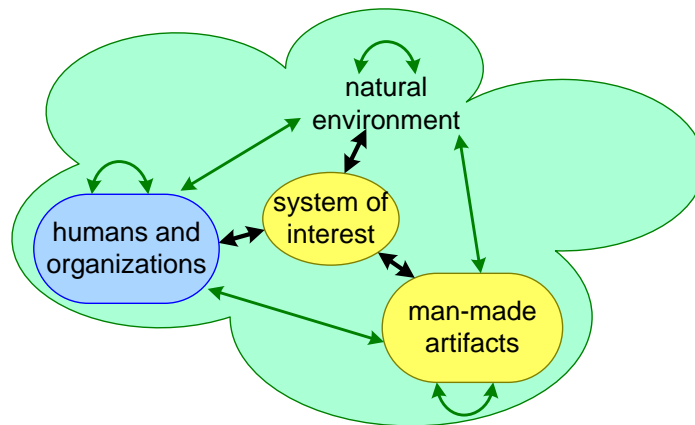


Figure 1: The context of a System-of-Interest

Figure 2 elaborates the elements further. Stakeholders can be individual humans or organizational entities. Social, political, and psychological characteristics drive their behavior. That means that emotions play a significant role, which triggers a risk of ill-behaving stakeholders. This is in contrast with man-made artifacts, which are often engineered systems. Technical characteristics primarily determine the behavior. We assume rationally designed systems that will behave well when the engineers do their job well. Question is whether complex systems, systems of systems, and sociotechnical systems will behave well. Do we understand our man-made artifacts well enough?

Natural systems in the environment may be biological. Nature and biological systems may behave chaotically from our perspective.

The overarching question is how well do we understand the context, so, how well can we understand the behavior of our system of interest in its context? This paper focuses on the stakeholders.

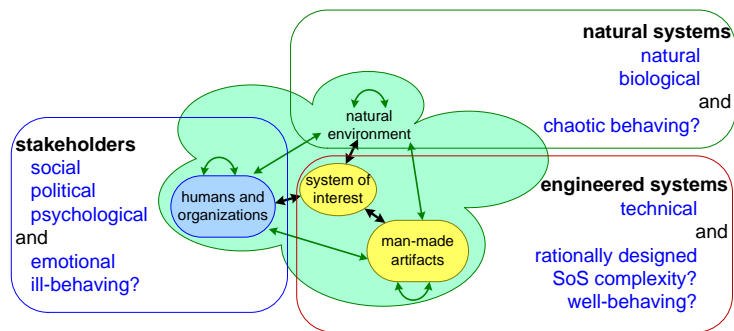


Figure 2: The context of a System-of-Interest

2 Abstracting Stakeholders

[3] explains that we can view a system at many levels of abstraction, e.g. without details or with more details. It visualizes this by using an exponential scale. Then it shows that you can do the same with the system context. Figure 3 takes this one step further and shows stakeholder related aspects at the various abstraction levels.

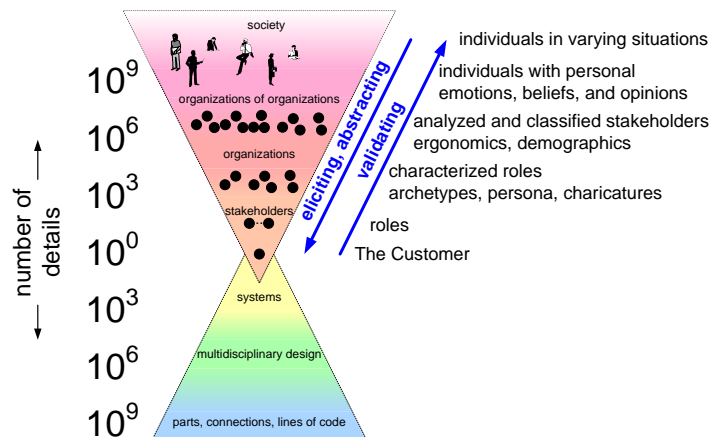


Figure 3: Abstraction from humans to roles

Figure 4 elaborates the upper pyramid further. When we start at societal level, we have billions of people with many relevant behaviors and characteristics. These are individuals in varying situations, where we can observe behaviors, pains, interests, concerns, patterns, with many variations, and exceptions. In a first abstraction step, we reduce variations and exceptions, by looking at the common patterns. In that way we get individuals with personal emotions, beliefs, and opinions.

We can abstract the individuals into stakeholders, by observing workflows,

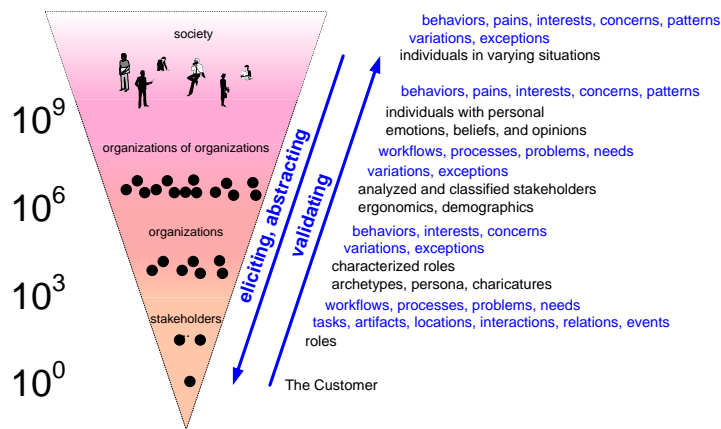


Figure 4: Elaborating what to observe

processes, problems, needs with its variations and exceptions. The result is analyzed and classified stakeholders with ergonomics and demographics. Further observation of behaviors, interests, concerns with its variations and exceptions, resulting in characterized roles archetypes, persona, caricatures.

Once more abstracting results in the main workflows, processes, problems, needs, tasks, artifacts, locations, interactions, relations, and events. We then have simplified stakeholders in a limited set of roles (such as project leader, electrical engineer, marketing manager, etc.). Figure 5 shows an example of roles in acquirer and supplier, relevant for the acquisition and delivery of systems in a business-to-business setting. A common (over)abstraction is “the customer”.

	CTO	CIO	CEO	CFO	COO
acquirer	<i>acquisition</i>			<i>asset management operation</i>	
	procurement		purchasing	logistics	
	engineer		operator cleaner maintainer		
	admin	HR	IT	accounting	
supplier	<i>development</i>		<i>production + life cycle support</i>		
	marketing		sales	1 st line service	
	project leader		2 nd line service		
	procurement		purchasing	3 rd line service	
	engineers		logistics	manufacturer	warehouse
			assembly	test	
	admin	HR	IT	accounting	

Figure 5: Elaborating what to observe

This description is from detail to abstraction, which requires eliciting of insights and capturing abstractions through interaction with stakeholders. Reversely, we need to validate our abstractions by testing them in the real world, also through stakeholder interaction. Once we have an initial set of roles, we can make them more specific again (moving upwards) to increase insight.

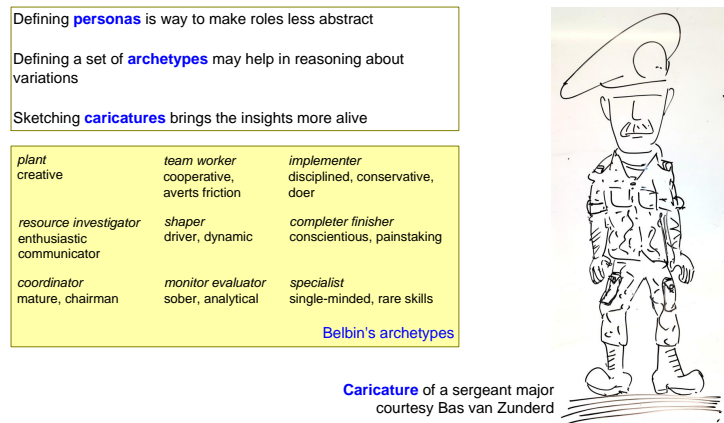


Figure 6: Making roles more specific using personas, archetypes, and caricatures

Figure 6 shows a few ways to make roles more specific in an insightful ways. A common technique, among others in software engineering, is defining personas. Another technique is defining archetypes. The Belbin roles are actually kind of archetypes. In discussions, it may also help to sketch caricatures.

3 Introduction to Stakeholders from abstract to humans

Figure 7 shows a supplier company in its ecosystem with many stakeholders of systems engineers. There are many stakeholders within the engineering departments, in the broader organization including all lifecycle support functions, and the again broader ecosystem, and the customer ecosystem. Many roles in the organization have a responsibility for a subset of stakeholders. The black dots in the figure, denoted as proxies engage such subset. For example, the sector director for service will represent service stakeholders.

Systems engineers will engage these proxies frequently. However, their challenge is to sample the stakeholders these proxies represent as well. The systems engineers need to understand the various stakeholders sufficiently to engage effectively with the proxies. For example, knowing what to look for and what to ask.

Figure 8 elaborates for several roles what stakeholders they represent, and hence where they focus when engaging. The challenge for systems engineers is to know how much to sample and who to engage directly.

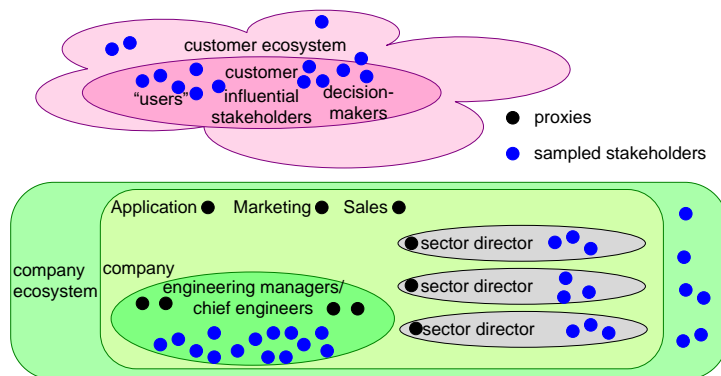


Figure 7: Multiple people engage stakeholders; creating context understanding is team effort

- Sales: customer stakeholders with decision power or big influence
 - Marketing: customer stakeholders and the wider customer ecosystem
 - Application: customer stakeholders that actively work with the system
 - Sector directors: (manufacturing, customer support, etc.) life cycle stakeholders and the wider life cycle ecosystem
 - Systems engineers: sampling enough relevant stakeholders to work with their problem and topic of interest
- How can systems engineers know what is enough sampling and what stakeholders are relevant?**

Figure 8: Who engages stakeholders?

We see that systems engineers know that they need to engage stakeholders. However, probably handicapped by limited social skills and introversion, they tend to contact stakeholders way too little. Figure 9 shows kind of maturity model for engaging stakeholders.

- The most basic level is listening and observing stakeholders in their environment.
- This allows them to start understanding what they do, how they do it, what they use, whom they communicate with.
- The next step is understanding stakeholder pains, concerns, interests, and needs.
- Which then allows them to empathize with stakeholders in a genuine way.

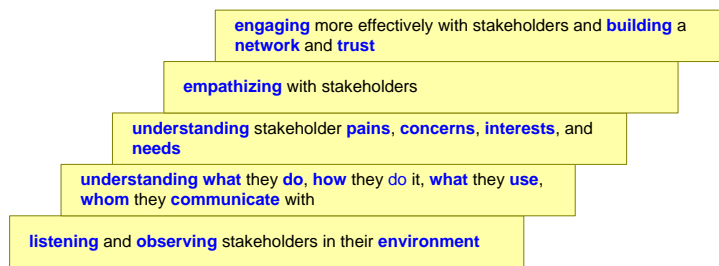


Figure 9: Increasing competence levels to achieve a trusful network

- Ultimately, systems engineers need the competency to engage more effectively with stakeholders and building a network and trust

4 An approach to engage stakeholders

Figure 10 shows an approach to engage stakeholders.

- Analyze the field of stakeholders, discuss them and make a map capturing the stakeholders, their positions, and their relations.
- Select a subset of stakeholders to contact them.
- Prepare by reading, searching, discussing, sketching and making diagrams.
- However, engage early and do not postpone that. That requires time-boxing of the initial steps, especially the preparation.
- Capture and communicate insights somewhat more structured, e.g. using A3 architecture overviews [1].
- Keep repeating these steps!

5 Acknowledgements

Bas van Zunderd provided the charicature of a sergeant major. Natansh Vyas inspired this presentation. Kristin Falk provided feedback on not working diagrams and text. Omid Razbani caught linguistic mistakes.

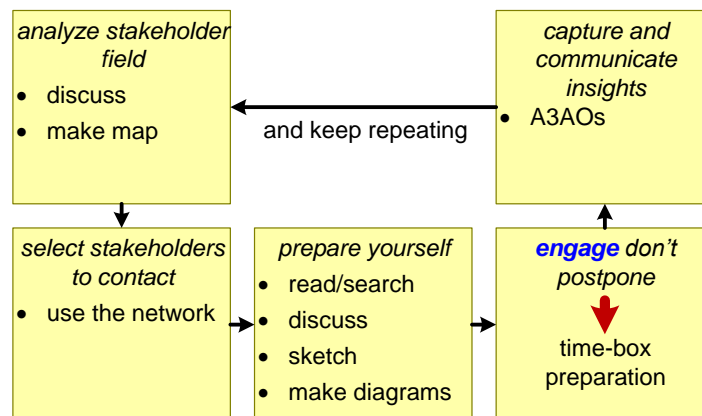


Figure 10: An approach to engage stakeholders

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- [1] Daniel Borches. *A3 Architecture Ovevriews: A Tool for Effective Communication in Product Evolution*. Ph.D. thesis. Woormann Print Service, Enschede, Netherlands, 2010.
- [2] Gerrit Muller. The system architecture homepage. <http://www.gaudisite.nl/index.html>, 1999.
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