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HOW TO ASSESS ACTORS FOR AN OPEN INNOVATION-PROJECT?

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ABSTRACT

Companies are confronted with an increasing variety of challenges such as shortened development cycles or higher demand of market orientation. One potential solution is collaboration with external partners/actors in terms of Open Innovation (OI). This allows several advantages such as the utilization of external expertise and reduced risk of market fails. However, OI itself bears "new" risks which are often related to the choice of external actors, e.g. insufficient effort-benefit ratio or knowledge drain. So far, adequate methodical support is limited. To allow an efficient identification and selection of actors, established approaches from other fields, such as stakeholder (SH) analysis, are enhanced by OI-specific methods. This paper presents an integrated assessment approach for determining relevant actors within a previously identified pool of SH. The approach combines elements from SH-analysis and Lead-User identification, enhanced by elements from complexity management.

INTRODUCTION

Nowadays companies are confronted with an increasing number of varying challenges such as shorter innovation cycles and a higher demand of market and customer orientation *(Gassmann & Enkel, 2004)*. One strategy to overcome these challenges is collaboration with external partners/actors in terms of Open Innovation *(OI)*. Thus, a company's innovation process is opened to its environment to allow inflows and outflows of knowledge which enables new innovations *(Chesbrough, Vanhaverbeke & West, 2006)*. Literature states several advantages of this purposive opening, such as the use of external expertise, shorter development times and reduced risk of market fails *(Enkel, 2009)*. However, OI itself bears a couple of risks resulting from the "new" openness, e.g. knowledge drain, Not-Invented-Here syndrome or focusing on niche markets *(Braun, 2012)*. These risks are often directly or indirectly related to the planning of an OI-project – especially to the selection of external actors, as for instance by choosing not-beneficial actors or missing relevant ones *(Guertler, Holle, & Lindemann, 2014)*. Thus, appropriate methodical support is crucial to the success of OI. In *(Gürtler & Lindemann, 2013)* we present a methodical framework for planning an OI-project. Also here, a central element is the identification and selection of relevant OI-actors. At this, identifying and selecting potential partners is not a new phenomenon but an integral part of different approaches, such as Requirement Engineering and Systems Engineering *(Haskins, 2006)*. Both of them use the stakeholder *(SH)* approach which was introduced by Freeman *(1984)* and is well-established in project management, such as for identifying relevant stakeholders for offshore wind energy projects *(Mostashari, 2005)*.

However, SH-analysis bears some deficits in terms of OI, as SH-analysis focusses on strategic aspects and misses a technical perspective. This technical perspective is crucial for an OI-project as usually a technical issue needs to be solved *(Guertler, Lewandowski, Klaedtke, & Lindemann, 2013)*. This technical perspective is addressed by OI-specific approaches such as Lead-User identification. These in turn lack a political strategic perspective *(Guertler et al., 2013)*. Hence, an integrated approach bears great potential by combining the strengths of both approaches.

This paper presents an integrated OI-compatible assessment and representation method for direct and indirect stakeholder dependencies. By this, it lays the basis for a following determination of efficient cooperation strategies. The terms "stakeholder" and "potential OI-actor" are used synonymously in this context.

1. Stakeholder Analysis and Lead-User identification

Stakeholder (SH) analysis

Stakeholder analysis was introduced by Freeman *(1984)*. He defines stakeholder *(SH)* as "any group or individual who can affect or is affected by the achievement of the firm's objectives." The SH-approach allows the identification and selection of relevant SH for e.g. projects. It supports the analysis of SH's interests, needs, influence and relationship to other SH. Over the years a large number of different SH-analysis processes were developed and adapted *(Guertler et al., 2013)*. Bryson *(2004)* presents an overview about common methods supporting the identification and assessment of SH, such as a graphical SH-map, a power-versus-interest portfolio, SH-influence-diagram, a graphical SH-issue interrelationship diagram and a participation planning matrix with generic involvement strategies. Another established assessment method is the analysis of SH-attributes and classes, introduced by *(Mitchell, Agle, & Wood, 1997)*. Which analyses SH regarding three attributes, whether existing or not:

- Power: "access to coercive, utilitarian, or normative means, to impose its will in the relationship".
- Legitimacy: "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions".
- Urgency: "calling for immediate attention".

The majority of SH-analysis processes focus on management issues and company policy issues. In the context of product development, they are mainly considered as source of requirements, e.g. within Requirement Engineering. So far, SH as problem solvers or innovators in terms of OI have only been rudimentarily considered, such as in *(Vos, 2004)*.

Lead-User identification

The Lead-User approach was introduced by von Hippel *(1986)* and enhanced over the years. By definition, Lead-Users already face needs which the majority of customers will first show in the future. Additionally, Lead-Users have the expertise and motivation to contribute to a corresponding solution. There are different methods for identifying technically capable users, such as Screening, Pyramiding, etc. *(von Hippel, Franke & Prugl, 2006)*. However, by focusing on a technical perspective only, in return Lead-User identification lacks a strategic political perspective *(Guertler et al., 2013)*.

Integrated OI-actor identification and analysis

Based on the analysis of 14 different SH-analysis and four Lead-User identification processes, we derived a generic actor identification process containing five steps: *(1)* Planning/Preparation; *(2)* Identification and Analysis; *(3)* Prioritization and Selection; *(4)* Cooperation Strategy; and *(5)* Involvement *(Guertler et al., 2013)*.

This paper addresses step *(2)* by presenting an approach for analyzing and assessing identified SH/potential OI-actors. This serves as a basis for selecting OI-actors and deriving appropriate cooperation strategies.

2. Integrated OI-Actors Assessment Approach

For a better comprehensibility, the approach is presented by the use of an industrial evaluation case study. Due to confidential issues, data is anonymized and simplified at some points. In the context of the reorganization of its development process, a German large-scale enterprise from the automotive sector is developing a new sub-process vertically connecting different departments within the company. For an efficient implementation of this sub-process, the responsible project team needed to identify relevant actors to connect the new process with the development process. Tough, this issue is strongly linked to "classical" SH-analysis, also a technical perspective is important. Actors are also required for a technical contribution by identifying, defining and developing process interfaces as well as enhancing and adapting process elements.

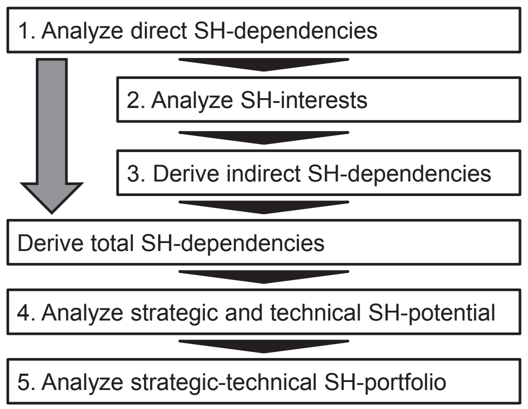

FIGURE 1. *Integrated OI-Actors Assessment Approach*

Figure 1 shows the setup of the OI-actors assessment approach. Starting with the analysis of direct SH-dependencies *(1)*, SH-interests in specific project's or company's issues are analyzed *(2)*. This serves as basis for deriving indirect SH-dependencies *(3)*. Based on this, the strategic and technical SH-potential *(4)*, a SH-portfolio analysis is conducted *(5)*. The approach itself is tailorable. For instance, depending on the specific project goal and situation, step *(2)* and *(3)* might be skipped as in this industry case.

	Name of actor	Description
a	head of product line engineering 1	senior manager, part of top management, long engineering background, responsible for planning and complete product line
b	head of product line engineering 2	senior manager, part of top management, responsible for planning and complete product line
c	head of product line package for line engineering 1	workgroup manager with focus on vehicle and component integration on total vehicle level
d	head of component package in project A	workgroup manager, responsible for component integration at level of a single department
e	head of component package in project B	senior engineer with focus on component package
f	head of development electrical components in project A	senior manager with experience in several development projects
g	head of development power components in project A	senior manager with experience in several development projects
h	head of development main components in project A	senior manager with experience in several development projects
i	head of development drive components in project A	senior manager with experience in several development projects
j	head of project A	senior manager, part of top management, experienced project manager
k	head of project management office of project A	senior project management expert in supportive function for project A

TABLE 1. *Identified stakeholders*

Strategic SH-attributes	Technical SH-attributes
Influence/power on product design process	Technical Know-how
Interest in design process	Process- and project-orientated thinking
Legitimacy – Hierarchy	Methodical planning
Legitimacy – Credibility	Willingness for change
Urgency	Period of employment

TABLE 2. *SH-attributes*

The basis of the assessment approach is a pool of identified SH/potential OI-actors. Due to simplification reasons, in the following we do not consider the full set with approximately 100 SH but only a sub-set with 11 SH, as shown in **Table 1**.

As preparation for the assessment, strategic and technical SH-attributes were defined. Strategic attributes support the analysis of the strategic, political relevance of an actor. They are based on the attributes, introduced by *(Mitchell et al., 1997)*. Technical attributes *(the term "technical" stresses the difference to the classical strategic perspective)* analyzes the actors' capabilities or experience necessary to contribute to developing a solution. **Table 2** depicts the defined SH-Attributes.

Step 1: DSM-modeling of SH

In the first step, the list of SH is transferred into a Design Structure Matrix *(DSM) (Steward, 1981)*, as shown in **Figure 2**. In some cases, instead of a list also graphical SH-maps with initially identified SH-dependencies might exist. By the utilization of the DSM, dependencies/interrelationships between the SH are analyzed and detailed in terms of direction and strength. In this case, we define "dependency" as the "influence of one SH onto the decisions of another SH". To assess the strength of influence, in contrary to *(Mitchell et al., 1997)*, we propose a more detailed, progressive scale from 0 *(no dependency)*, 1 *(weak)*, 3 *(medium)* to 9 *(strong dependency)*. The DSM is not symmetrical due to hierarchical levels and roles within the organization, as depicted in **Figure 2**.

By summing up the dependencies of a row, the active sum of each SH can be derived. It is an indicator of the influence of a SH. The passive sum is calculated by summing up the dependencies of a column. It indicates how strongly a SH is influenced by another SH. The activity as quotient of active and passive sum indicated if a SH is more active or passive. Criticality as product of active and passive sum indicates the relative sensibility of a SH within a network *(Maurer & Lindemann, 2007)*.

The related analysis results are illustrated in **Figure 3**. The darker a SH-node, the higher the specific value is. Here, SH *(i)* and *(j)* show a high active sum, while SH *(d)*, *(g)* and *(h)* show a high

Direct Actor Dependencies

(0 = no, 1 = weak, 3 = medium, 9 = strong dependency)

		a	b	c	d	e	f	g	h	i	j	k	Active Sum	Activity	Criticality
head of product line engineering 1	a		0	9	3	1	1	1	1	1	0	0	17	0,53	544
head of product line engineering 2	b	0		1	0	1	0	0	0	0	0	0	2	0,50	8
head of product line package for line engineering 1	c	3	0		9	3	0	0	0	1	1	1	18	1,00	324
head of component package in project A	d	9	1	3		3	1	3	9	3	3	1	36	0,73	1764
head of component package in project B	e	3	1	3	9		0	3	1	1	0	0	21	1,62	273
head of development electrical components in project A	f	0	0	0	1	1		9	9	3	3	1	27	1,00	729
head of development power components in project A	g	9	1	0	3	1	9		9	3	3	1	39	0,89	1716
head of development main components in project A	h	1	1	1	9	1	3	9		3	9	3	40	0,83	1920
head of development drive components in project A	i	3	0	1	9	1	3	9	9		9	1	45	1,80	1125
head of project A	j	3	0	0	3	1	9	9	9	9		3	46	1,24	1702
head of project management office of project A	k	1	0	0	3	0	1	1	1	1	9		17	1,55	187
Passive Sum		32	4	18	49	13	27	44	48	25	37	11			

FIGURE 2. *DSM with direct SH-dependencies*

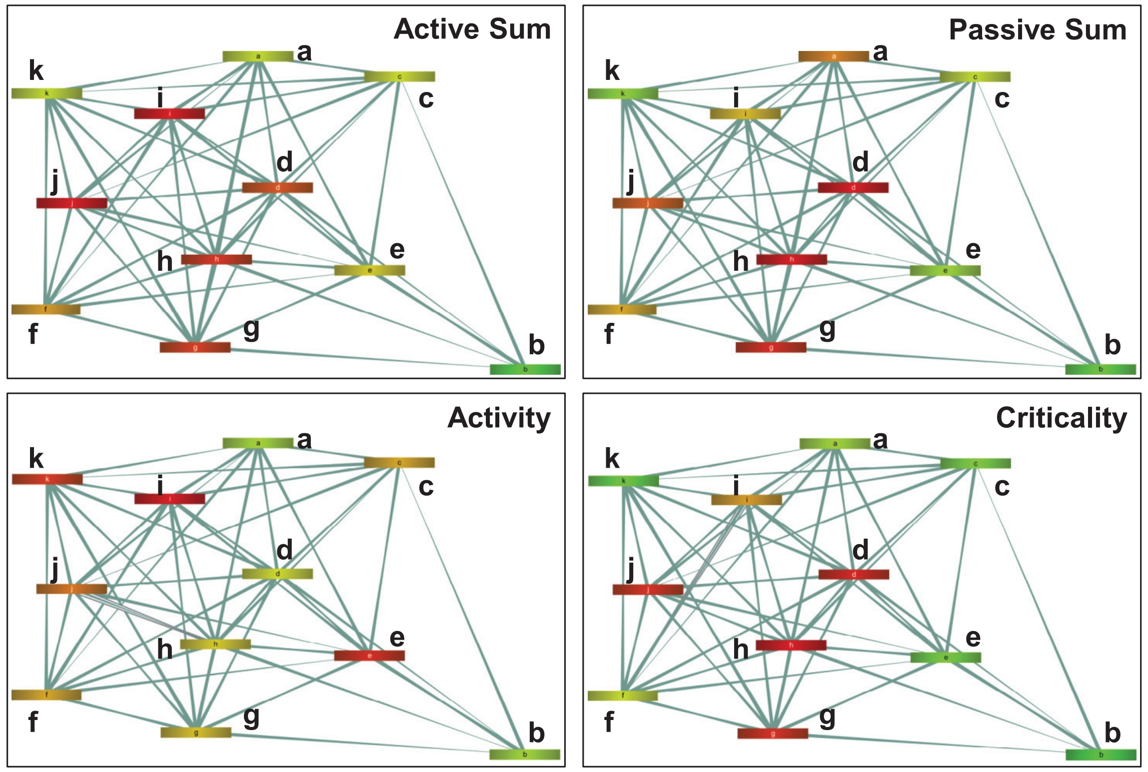

FIGURE 3. *SH-network – graphical analysis (the darker a node, the higher the value)*

passive sum. SH *(e)* and *(i)* show a high activity. SH *(h)* displays a high criticality, followed by SH *(d)*, *(g)* and *(j)*.

Step 2: Modeling of stakeholder interests

This step was not conducted within the industry case. Thus, it is explained only abstractly. In step 2, the interests of each SH in the project, company, etc. are identified. These interests are mapped to the SH using a Domain Mapping Matrix *(DMM) (Danilovic & Browning, 2004)*, *(Danilovic & Browning, 2007)*. **Figure 4** shows the resulting DMMs. The left DMM depicts the active interests of each SH. Here, positive numbers indicate a positive connection to this interest and vice versa. The strength of the individual interest can be weighted on a progressive scale from 0 *(no)*, 1 *(low)*, 3 *(medium)* to 9 *(strong interest)*. In the example, SH 5 is strongly and positively interested in interest 1 *(e.g. the OI-project)* while SH 1 is negatively interested in interest 2 *(e.g. the regarded product)*. A negative interest means an opposition to the company's or in this case project team's point of view or goal.

The right DMM shows how SHs are affected by interests or the passive connection between SH and interest. In the example, interest 1 strongly and negatively influences SH 4 *(e.g. the product: a windmill in front of a house)* while interest 3 positively and strongly influences SH 6 *(e.g. the construction of a new internet cable)*.

„have“	Interest 1	Interest 2	Interest 3	...
SH 1		-3		
SH 2				
SH 3				
SH 4				
SH 5	9			
SH 6			9	
SH 7				
...				

„affect“	SH 1	SH 2	SH 3	SH 4	SH 5	SH 6	SH 7	...
Interest 1				-9				
Interest 2			3					
Interest 3						9		
...								

FIGURE 4. *SH-interest DMM and Interest-SH DMM*

Step 3: Analysis of indirect stakeholder relationships

As the previous step, this step was not conducted within the industry case. Thus, it is explained only abstractly. In the third step, the identified SH-interest DMM and Interest-SH DMM are used to derive indirect dependencies between SH by matrix multiplication.

	SH 1	SH 2	SH 3	SH 4	SH 5	SH 6	SH 7	...
SH 1			-9					
SH 2								
SH 3								
SH 4								
SH 5				-81				
SH 6						81		
SH 7								
...								

FIGURE 5. *Indirect stakeholder dependencies*

The darker fields in **Figure 5** indicate SH dependencies via the same interests. For instance, SH 1 and SH 3 are negatively connected via interest 2. These indirect SH-dependencies can cause unforeseen long-distance effects which might risk the success of a project if not considered adequately, based on *(Maurer & Lindemann, 2007)*.

Step 4: Determination of political and technical potential

In step 4, each SH is analyzed regarding the previously defined SH-attributes. The analysis can be conducted in two ways:

- directly: by using Lead-User methods such as screening and gaining data directly from the SH, or
- indirectly: by a discussion within the project team.

Figure 6 depicts the assessed attribute values for each SH. The strategic attribute "Influence/power on product design process" is derived from the normalized active sum of each SH *(mapped to the progressive scale by* [1; 1,7[= 1; [1,7; 5,2[= 3; [5,2; 9] *= 9)*. The attribute "interest in design process" can also contain negative values if the specific SH's interest is opposite to the project team *(here: the implementation of the design sub-process)*. In this case, SH *(g)* represents a weak, SH *(f)* a medium and SH *(h)* a strong opposition while the rest of the SHs have a supportive interest in implementing the design sub-process.

It is also possible to weight each attribute regarding its relevance to the project. In the regarded case study, each attribute was defined as equivalent and their weights set to 1.

Based on the single attributes, we derived the strategic and technical potential by summing up all weighted strategic, respectively technical attributes. The normalized potentials allow the mapping of each SH in the strategic-technical SH-portfolio, depicted in **Figure 7**.

Potential project actors	Strategic Attributes: Influence on product design process	Interest in design process	Legitimacy - Hierarchy	Legitimacy - Credibility	Urgency	Sum of strategic potential	Normalised	Technical attributes: Technical Know-how	Process- and project-orientated thinking	Methodical planning	Willingness for change	Period of employment	Sum of technical potential	Normalised
Weighting	1	1	1	1	1			1	1	1	1	1		
a	3	1	3	1	1	9,0	0,20	9	0	0	1	9	19	0,42
b	1	9	3	3	1	17,0	0,38	9	9	9	9	9	45	1,00
c	3	3	1	3	3	13,0	0,29	3	3	1	9	1	17	0,38
d	3	3	1	9	9	25,0	0,56	1	3	3	3	3	13	0,29
e	3	9	1	9	1	23,0	0,51	9	9	9	9	3	39	0,87
f	3	-3	3	9	9	21,0	0,47	9	3	9	1	9	31	0,69
g	3	-1	3	9	9	23,0	0,51	9	1	1	0	9	20	0,44
h	3	-9	3	3	9	9,0	0,20	9	0	3	0	9	21	0,47
i	9	3	3	3	9	27,0	0,60	9	9	3	3	3	27	0,60
j	9	9	9	9	3	39,0	0,87	9	9	9	3	9	39	0,87
k	3	9	9	1	1	23,0	0,51	1	9	9	9	1	29	0,64

FIGURE 6. *Analysis of SH-attributes and political and technical SH-potential*

Step 5: Portfolio analysis

Based on the analysis results of step 4, all SHs are mapped into a strategic-technical SH-portfolio. The x-axis depicts the technical potential, calculated as described before. The y-axis depicts the strategic potential. Within the portfolio, four sectors can be differentiated. Based on *(Mitchell et al., 1997)*, we propose the following adapted generic cooperation strategies:

- Sector A (high strategic and high technical potential):

Definite involvement: for contributing a technical solution within the OI-project or for evaluation of the results.

- Sector B (low strategic and high technical potential):

Secondary involvement: for contributing to technical solutions due to low strategic but high technical potential. The SHs in this group need to be evaluated carefully because some Lead-User and cross-industry experts might belong to this group.

- Sector C (high strategic and low technical potential):

No involvement for contributing to the technical solution but involvement in a political-strategic way, for instance by keeping them informed, or they might evaluate or confirm specific results.

- Sector D (low strategic and low technical potential):

No involvement due to missing strategic and technical potential.

However, as mentioned previously, dependencies between SH are a crucial success-factor for innovation projects, especially for OI-projects when involving additional external actors. To prevent unforeseen long-distance effects *(e.g. involving external OI-actors who are closely linked to a competitor)*, it is necessary to be aware of SH-dependencies when prioritizing and selecting OI-actors. Thus, we combine the traditional portfolio model with a dependency representation, as illustrated in **Figure 7** for strong and medium dependencies.

Based on the strategic-technical potential analysis, SH *(j)*, *(i)*, *(k)* and *(e)* should be actively involved into the project while SH *(a)*, *(c)* and *(h)* should be ignored. However, as the dependency analysis reveals, SH *(h)* has a strong mutual influence on SH *(j)*. This is especially relevant since SH *(h)* has a negative interest in the project. Due to the risk of negatively influencing SH *(j)*, also SH *(h)* needs to be adequately addressed/ considered when planning the single cooperation strategies. The integrated analysis also reveals the high importance of considering SH *(d)* and *(g)* due to their high degree of influence. The derivation of specific cooperation strategies will be addressed in a future paper.

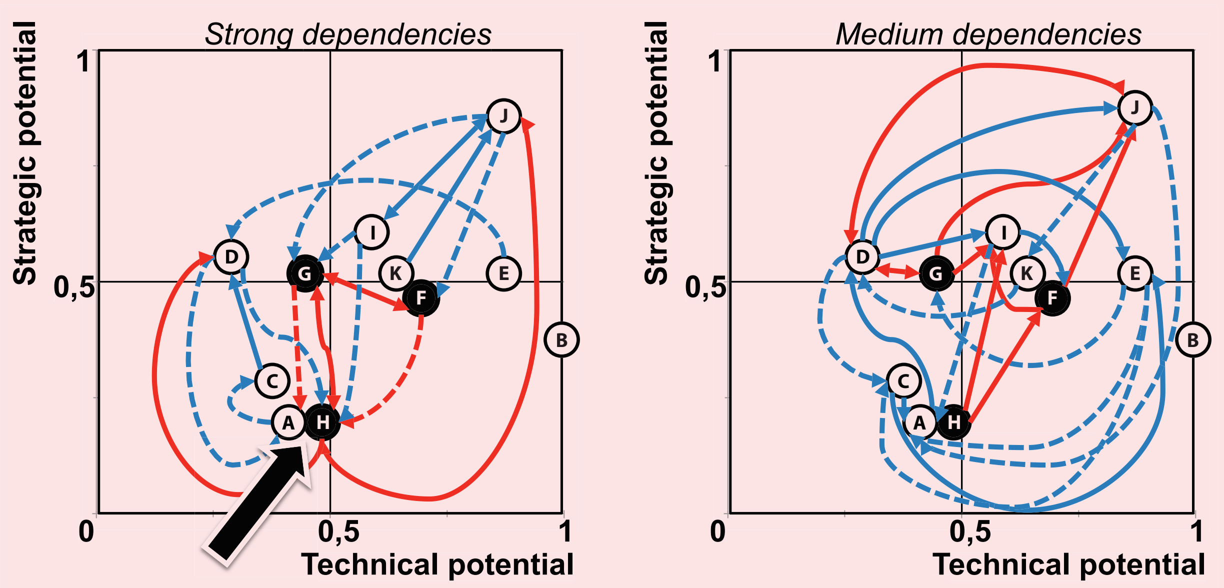

FIGURE 7. *Strategic-technical SH-portfolio (straight lines are influences from "secondary" SH to "primary" SH; dark nodes indicate negative SH)*

3. Conclusion and outlook

So far, strategic aspects are only insufficiently regarded when selecting OI-actors. This is reflected in various OI-risks mentioned by academia and industry, such as knowledge drain or Not-Invented-Here syndrome. Hence, it is necessary to combine a strategic and a technical perspective when analyzing potential OI-actors. The presented assessment approach combines strategic elements from SH-analysis with technical aspects from Lead-User identification and complexity management. This allows a consistent assessment of potential OI-actors regarding their relevance for an OI- project. The strategic-technical portfolio analysis allows the derivation of generic cooperation strategies. By the enhancement by SH-dependency analysis, relevant influences between SH can be revealed which need to be considered to ensure the success of an OI-project.

In the next steps the assessment approach needs to be evaluated for a larger number of SH. Therefore, the challenges are the assessment of all SH-attributes and a clear depiction within the portfolio. A promising solution might be the use or development of a software tool. Besides, the generic cooperation strategies need to be evaluated and more elaborated to allow an efficient involvement of OI-actors.

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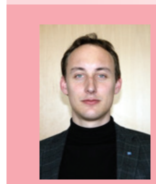

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