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Sam Solaimani

*Delft University of Technology, The Netherlands, h.solaimani@tudelft.nl*

Harry Bouwman

*Delft University of Technology, The Netherlands and Åbo Akademi, Finland, w.a.g.a.bouwman@tudelft.nl*

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## Stakeholder Analysis enriched with the Analysis of Inter-Organizational Interactions and Interdependencies: Case-study on innovative Smart Living projects

**Sam Solaimani**

Delft University of Technology, The Netherlands

h.solaimani@tudelft.nl

**Harry Bouwman**

Delft University of Technology, The Netherlands and Åbo Akademi, Finland

w.a.g.a.bouwman@tudelft.nl

### **Abstract**

*To become more innovative, increasingly companies in Smart Living domain initiate and participate in trans-sector collaborations. Trans-sector collaboration is marked by involvement of various actors from distinct sectors with sometimes, if not often, conflicting strategic interests and incoherent operational business processes and procedures. To gain an in-depth insight into the actors' relationships and interactions, 'stakeholder analysis' is suggested and adopted by many scholars and practitioners. However, the literature on stakeholder analysis is too concerned with abstract strategic analysis, often limited to conceptual and static understanding of stakeholders. This paper argues that a "true" understanding of stakeholders can only be achieved by analyzing the stakeholders' interactions and interdependencies. This study borrows a conceptual framework from service innovation domain, i.e. the VIP framework, to extend stakeholder analysis by a systematic analysis of stakeholders' dynamic requirements and interactions. The qualitative evaluation of the frameworks application shows that this extension is needed to gain in-depth understanding of stakeholders, and the potential operational conflicts and critical dependencies between them, that otherwise would be overlooked.*

**Keywords-** Stakeholder Analysis, The VIP Framework, Inter-Organizational Interactions, Trans-sector Collaborations, Smart Living

## **1 Introduction**

The concept of Smart Homes that mainly was focusing on home automation has evolved during the last three decades to broader concepts of Ubiquitous Computing, Ambient Intelligence, Internet of Things, and more recently, Smart Living (Solaimani, Bouwman and Baken, 2011). The collaborations in Smart

Living domain are not only transcending the limited physical boundaries of the living environment, it also goes beyond the traditional boundaries of industry sectors. Increasingly firms are seeking for new opportunities beyond their existing and established eco-system and collaborate with actors from diverse sectors (Solaimani, Bouwman and De Reuver, 2010; Solaimani and Bouwman, 2012). With the emergence of greater numbers of trans-sector innovations, the identification and management of stakeholders becomes more complex (Bunn, Savage, and Holloway, 2002). A frequently employed approach to reduce this complexity is 'stakeholder analysis' which aims at understanding a system and changes in it, by identifying key actors or stakeholders and assessing their respective interest in that system (Grimble and Wellard, 1997). An immense amount of publications have devoted attention to a wide variety of topics related to this concept (Donaldson and Preston, 1995). Yet, the literature on stakeholder analysis is mainly dominated by abstract, mainly static, interpretation of stakeholders and their interactions and requirements, rather than theorizing the meaning and impact of such an analysis. Even the publications on 'stakeholder analysis design' insufficiently delve into the operational arrangement of stakeholders interactions. Accordingly, most stakeholders publications are centered around topics such as stakeholder analysis definition, classification, application domain, and abstract stepwise methods to perform the analysis.

The practice, however, points out towards a different direction in two ways. Firstly, our experience shows that stakeholders and their interactions are permanently changing, and therefore, a static view of stakeholders does not fit the reality. In another article, Bouwman et al. (2010), suggest to adopt a dynamic stakeholder analysis throughout innovation projects up till the commercialization phase. Secondly, a stakeholders analysis should permanently and systematically considers the stakeholders interactions in operational terms (Solaimani, Bouwman and De Reuver, 2010; Solaimani and Bouwman, 2012). So, besides the dynamic course of analysis, we need to understand by what components the stakeholders interactions are constituted, how these interactions are organized within the network of stakeholders, and how these interactions impact stakeholder's Business Model. A dynamic analysis of the stakeholders and their operational interactions is the focus of this paper. For this aim, we firstly discuss the existing literature on stakeholders analysis. The literature provide many aspects of stakeholder analysis, including its definitions, classifications, applications, design methods and such. However, the two vital characteristics of a sound stakeholder analysis, being dynamic and operational are insufficiently captured by the literature. Therefore, this paper borrows a conceptual Business-Operations alignment framework, i.e., the VIP framework, developed and applied in field of service innovation (Solaimani, Bouwman and De Reuver, 2010; Solaimani and Bouwman, 2012). This generic framework seems promising as, (1) it zooms in on stakeholders identification, operational interactions and interdependencies, as well as (2) the dynamic relationship between these operational components. Following the VIP framework, the operational components that need to be considered in stakeholder analysis are (1) explication of values exchange between stakeholders, (2) the information resources exchanged between stakeholders, and (3) the operational business processes shared between stakeholders. These generic domains aim at bridging the stakeholders' strategic visions with the operational arrangement of stakeholders regardless the context of the project or business they are involved in. This framework is applied in three innovation projects to support them systematically during their stakeholder analysis. The impact of the framework is qualitatively evaluated during the projects. The projects should be considers as small-scale illustrative case study to open up the theoretical debate around operationalization of stakeholders analysis and stakeholders requirements elicitation. Thus, extending these high-level approaches with analysis of the stakeholders operations on various levels of abstraction, i.e., exchange of resources as well as processes and procedures. Theoretically, this paper is a modest attempt to contribute to the literature on stakeholder analysis design, stakeholders

requirements analysis, and strategy-operation alignment, while practically aims to attract more attention towards an extended stakeholder analysis, especially, in Smart Living domain where increasingly open innovation projects are characterized by trans-sector collaborations.

The remainder of the paper is structured as follows. Next section gives an overview of the literature on stakeholder analysis. Then, the literature on stakeholder design and its limitations are discussed. To tackle the limitations, the VIP framework is presented and employed in three illustrative case studies. Additionally, the framework's application is evaluated. This paper concludes with a discussion on lessons drawn from the cases and implications for practice.

## **2 The concept of Stakeholder Analysis**

Since the formal introduction of the stakeholder concept in 1963, when the word appeared in an international memorandum at the Stanford Research Institute (Freeman, 1984), numerous books and articles with primary emphasis on the stakeholder concept have been published (Donaldson and Preston, 1995). These publications are from diverse disciplines, including business management, international relations, policy development, participatory research, ecology, and natural resource management (Ramírez, 1999). The literature on stakeholder analysis is even larger, because the concept of stakeholders has been reflected in many speeches and writings before its formal introduction in 1963 (Preston and Sapienza, 1990). Freeman, in his seminal work, defines a stakeholder as, "...in an organization is (by definition) any group or individual is who can affect or is affected by the achievement of the organization's objectives (Freeman, 1984)". The definition resonates with another widely accepted definition provided by Clarkson (1995) who defines stakeholders as, "persons or groups that have, or claim, ownership, rights, or interests in a corporation and its activities, past, present, or future." An analysis on the stakeholders, therefore, is a range of tools for the identification and description of stakeholders on the basis of their attributes, interrelationships, and interests related to a given issue (Ramírez, 1999; Pouloudi and Whitley, 1997).

The theory of stakeholders has been viewed from various perspectives (Bourne and Walker, 2005). Some scholars tend to associate stakeholder analysis with diagnosis and satisfaction of stakeholders expectations (Mason and Mitroff, 1981; Freeman, 1984), while others focus on concepts of justice, equity and social rights as concepts with major impact on stakeholders (Gibson, 2000). Donaldson and Preston (1995) described stakeholder theory by characterizing it as a descriptive/empirical (i.e., describes what a corporation is), instrumental (i.e., examines the connections between the practice of stakeholder management and the achievement of goals), and normative (i.e., interprets the function of the corporation including the identification of moral or philosophical guidelines for the operation and management of corporation). Another perspective is proposed by Goodpaster (1991) who pursues stakeholder analysis along the ethical values. Some authors anchor the stakeholder theory to marketing strategy formation and strategic marketing planning (Polonsky, 1996; Clulow, 2005). From a performance management perspective, Simmons and Lovegrove (2005) demonstrate the integrity and value of stakeholder analysis as a 'middle ground' research method. In the field of requirements engineering, Sharp, Finkelstein, and Galal (1999) emphasize the relevance of stakeholder theory as a domain-independent, effective and pragmatic foundation to elicit the stakeholders' requirements.

The literature on stakeholder analysis also shows that several authors have attempted to identify and classify stakeholders. Clarkson (1995) classifies them as the primary stakeholders, who are essential to survival and wellbeing of the organization, and the secondary stakeholders, with who an organization interacts, but the interactions are rather complementary than essential. Wheeler and Sillanpää (1997)

categorize stakeholders by their level of influence on a firm (primary or secondary), and the nature of their influence (social or non-social). Briner, Hasting, and Geddes (1996) identified four sets of stakeholder: client, project leader's organization, outside services, and invisible team members. Mitchell, Agle and Wood (1997) provide a comprehensive framework to define the field of stakeholders. Their framework has a dynamic nature that allows an explicit recognition of situational uniqueness and managerial perception to explain how managers prioritize stakeholders' relationships. This framework identifies stakeholders by (1) stakeholders' power to influence a firm, (2) the legitimacy of the stakeholders' relationships with a firm, and (3) the urgency of the stakeholders' claims on a firm.

### **3 The Design of Stakeholder Analysis**

Apart from definitions, identification and classifications of stakeholders discussed so far, the literature provides also different models and approaches to design and conduct a stakeholder analysis. Ittner and Larcker (2002) suggest to measure the level of influence of stakeholders. They built in a weighting of the strength of importance of a number of stakeholder relationships by first identifying the stakeholders, categorizing them, and eventually connecting them with different types of arrays. Carroll and Buchholtz (2003) applied the STEP model with its four major contributing environments, i.e., social, technological, economic and political, to identify the stakeholders (their sub-elements) and their relationships and influences. Clulow (2005) proposes a systematic discourse analysis that goes beyond the identification of key stakeholders, and different perspectives, including economy, sustainability and responsibilities, should be considered. Mason and Mitroff (1981) provide four steps to perform stakeholder analysis, (1) identification, (2) generation of assumption about stakeholder expectations, (3) evaluation of the assumptions, and (4) selection of strategies based on the evaluated assumptions. Mallot (1990) identifies a three-step framework for conducting the strategic planning process based on the stakeholder analysis, (1) identification of the stakeholders and their interests, domains and specifications, (2) description of the relationships between the stakeholders and the firm, and among the stakeholders (include the power relationships), and (3) incorporating concrete actions and time. Elaborated on the Freeman's (21) and Mitchell, Agle, and Wood's (1997) work, Elias, Cavana, and Jackson (2002) provide another systematic stakeholder analysis steps, (1) develop a stakeholder map of the project, (2) prepare a chart of specific stakeholders, (3) identify the stakes of stakeholders, (4) prepare a power versus stake grid, (5) conduct a process level stakeholder analysis, (6) conduct a transactional level stakeholder analysis, (7) determine the stakeholder management capability of the R&D project, and (8) analyze the dynamics of stakeholders. Schmeer (1999) provides comprehensive stakeholder analysis guidelines, consisted of eight major steps, (1) planning the process, (2) selecting and defining a policy, (3) identifying key stakeholders, (4) adapting the tools, (5) collecting and recording the information, (6) filling in the stakeholder table, (7) analyzing the stakeholder table, and (8) using the information. More recently Enserink et al. (2010) suggest to follow a six-step analysis (1) problem formulation, (2) inventory of the stakeholders involved, (3) development of a chart to illustrate stakeholders formal tasks, authorities, relations and current legislation, (4) determining the interests, objectives, and problems, (5) mapping out the interdependencies between stakeholders, and eventually (6) determining the consequences of these findings with regard to the initial formulated problems.

In addition to the step-wise methods discussed so far, there are a number of methodologies to facilitate a stakeholder analysis. Crosby (1992) (cf. Lindenberg and Crosby, 1981) provide a stakeholder matrix consisted of stakeholder identification, their interests, resources, resource mobilization capacity and position. Sambamurthy and Desanctis (1990) endorsed "unstructuredness" (Mintzberg, Raisinghani, and Theoret, 1976) as an important characteristic of stakeholder analysis, which leads to uncertainty and

equivocality problems during the analysis. They utilized Group Decision Support Systems (GDSS) to support communication and enhance understanding and consensus between stakeholders during stakeholder analysis. Gupta (1995) applied the Mallot's framework (1990) to construct a conceptual stakeholder map that illustrates the complexity of the networks of Interorganizational Systems (IOSs). Varvasovszky and Brugha (2000) provided a set of preliminary interrelated questions combined with qualitative research methodologies (e.g. interview, Delphi methods) to identify and understand the stakeholders needs, relations, and interests. Bourne and Walker (2005) have provided a mapping tool to visualize stakeholders power, influence and contribution within the performing organization.

From a design perspective, several frameworks are proposed to identify and understand stakeholders requirements. These frameworks are originating from various disciplines such as Information System (IS) design, Software Development, and System Design. Chung, Gross, Yu (1999) provide a model that systematically represents and addresses the quality requirements during architectural design by focusing on stakeholder dependencies. Hummel et al. (2004) affirm that the use of methods supporting and managing the knowledge from involved stakeholders improves the processes of design of stakeholders' model. Bergman, Lyytinen, Mark (2007) emphasize the relevance of the organizational and political context surrounding design. Their model describes that significant improvements in systems design can be achieved by focusing on questions, (1) what system(s) can be built and delivered within the given environment, and (2) how to align stakeholders' interests with the proposed designs to mobilize willingness and resources. Herder et al. (2008) combine a physical and social system design to acquire a better understanding of the behavior of socio-technical, complex systems, and to effectively support better designs and design processes. Pohl (2010) proposes a requirements engineering framework that consists of core requirements engineering activities in order to establish the vision within the existing context, techniques for eliciting, negotiating and documenting as well as validating, and managing requirements for software-intensive systems.

The actual process of stakeholders requirements elicitation is conducted by the so-called *trawling* techniques collected and presented by Robertson (2000), including, interviewing (Herder and Stikkelman, 2004), simulation models (e.g., scenarios, prototyping) (Chung, Gross, and Yu, 1999), use-case workshops (Luqi and Kordon, 2008), and like. In this regard, several methodologies are employed to identify and formalize the stakeholders requirements. Some examples are, the Natural Language Processing (NLP) to analyze the dialogs between stakeholders (Sawyer, Gacitua, and Stone, 2008; Kof, 2008); the i\* framework (Yu, 1997; Chung, Gross, and Yu, 1999) to reveal goals, tasks, resources of the stakeholders and exchanged between them (Teruel et al. 2011); meta-model to reveal the values exchanged, design variables, constraints and performance indicators (Herder and Stikkelman, 2004); Ballejos and Montagna (2011) propose a model for representing stakeholders, their roles, as well as their interest and influence attributes; and KAOS framework proposed by (2001) for eliciting, specifying, and analyzing goals, requirements, scenarios, and responsibility assignments".

So far, the literature on stakeholders' definitions, classifications, analysis, design tools and methodologies are briefly discussed. The majority of these techniques and models, however, insufficiently reflect on (1) the operational arrangement of stakeholders, as well as (2) the dynamic character of stakeholders and their roles, interactions and interdependencies. Regarding the first limitation, we see that many approach are predominantly focused on an abstract understanding of stakeholders rather than explicating what operational interaction components are of importance, and how these interaction components should be analyzed (e.g. the many stepwise analysis discussed earlier). There are a few approaches with a more focus on the operational aspects. However, the foci of these approaches are limited. Examples are the i\* framework that merely focuses on goals, tasks and

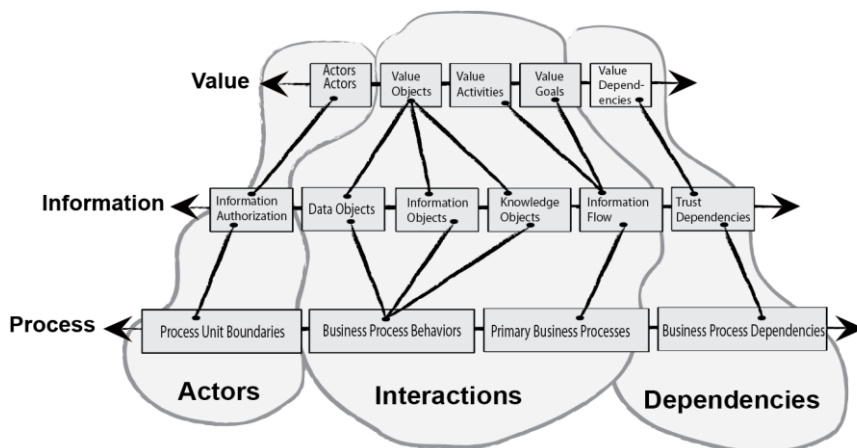
resources, or the architectural approaches that only take the information flow into account. Additionally, none of these two approaches consider the stakeholders operational business processes. Besides, most of the presented stakeholder analysis approaches provide a static view of the involved stakeholders and their interactions. Generally, these stakeholder analysis approaches are employed at the first stage of business, for example during the business development and not reiterated throughout the project. Bouwman et al. (2010) discusses that stakeholder analysis should not serve as a validation of the business/service concept. It rather should capture and evaluate the dynamic behavior and interests of stakeholders during the innovation/design project continuously, up till the final phases of project.

In the next section, we discuss an approach to dynamically enrich stakeholder analysis with insights into the operational arrangement of stakeholders.

## 4 The Operationalization of Stakeholder Analysis

This paper argues that a real challenge throughout a stakeholder analysis is "a systematically and dynamically analysis on the alignment between stakeholders' business objectives and their underlying operational arrangement". The business/operation alignment requires an in-depth understanding of stakeholders and their relations that only can be achieved by breaking open the stakeholders interactions. Zooming in on stakeholders interactions, however, implies almost detachment of stakeholders analysis from its traditional definition. Hence, we shall become more interested in the operational interactions of the stakeholders involved. In this regard, this paper applies an business/operations alignment framework, i.e., the VIP framework that is developed and applied in field of service innovation (Solaimani, Bouwman and De Reuver, 2010; Solaimani and Bouwman, 2012). The VIP framework seems promising since it digs into the operational arrangement of stakeholders to analyze the dynamic interactions and interdependencies between and within them. This analytical framework analyses the stakeholders interactions by decomposing it into three generic domains, (1) 'value exchange', which describes how value is created for, provided to, and captured from partners and customers; (2) 'information exchange' that describes which and how information resources are created and exchanged between stakeholders and reveals the information resource dependencies between the stakeholders, and (3) 'primary business processes' that describes the primary business activities of the stakeholders in a more detailed way (Figure 1).

Each domain is consisted of several sub-components. There is a dynamic interaction between and within the domains and its components. The components are centered around the value-creating actors (i.e., stakeholders), their interactions and interdependencies. In this regard, the value-oriented components analyze the dynamic relationship between actors, values they create, exchange and sustain, and their goals and dependencies between them. The information-oriented components analyze the actors' access to information resources as well as the flow of information and the information dependencies. The business process-oriented components contains the primary business processes, which are responsible for or enable the creation of the actual value. In addition, the behavior of business processes, within the actors' boundaries (e.g., company, business unit, system) and the possible process dependencies are subject to analysis in this domain.



**Figure 1:** The VIP framework and its components

As illustrated in Figure 1, the VIP framework has an integrative and hierarchical structure. The insight gained from the higher level layers can be inherited by the lower level layers. Yet, precisely the interplay between domains and components can be a source of conflict between actors on two levels of business and operations. The next section shows how stakeholder analysis is facilitated and enriched by the VIP framework. The evaluation of the VIP application is subsequently discussed.

## 5 Case Study

Fifteen undergraduate students have participated in three large “real-life” Smart Living innovative projects proposed by a number of companies from diverse industries, supported by university-based mentors. The projects were defined to last for a period of six months divided in two phases. During the first phase, the students (five members per each team), together with their industry and university partners, conducted a preliminary literature review and market research to write a business plan. In the second phase, the project teams primarily focused on the implementation of their business plan. At the end of the second phase, the teams would have the opportunity to continue as a start-up or incubator.

The three projects were Smart Merging (Team Mobility), Fossil-free Leeuwarden (Team Energy), and Preventive Health (Team Health). Team Mobility investigated the possibilities to support drivers by automatic, or better said, “smart”, merging on highways. They focused on IT-driven supporting systems and used simulation tools to assess and evaluate their smart merging system. Team Energy aimed at supporting the local council of Leeuwarden<sup>1</sup> to move towards their ultimate goal of having a fossil-free city in 2020. In this regard, the team investigated the possibilities to develop an integrative system that provides a real-time calculation and visualization of the financial impact of green investments in the province. Team Health concentrated on the development of a preventive health system that utilizes different gaming elements to motivate and facilitate its users to adopt a healthier life style, while improving the communication between users, medical centers and mental coaches.

At the beginning of the projects, all the teams have conducted a classical stakeholder analysis consisted of stakeholder identification, and identification of stakeholders business needs, and priorities (Freeman, 1984; Mason and Mitroff, 1981). In addition the teams were asked to extend their analysis by including

<sup>1</sup> Leeuwarden is the capital city of Dutch province of Friesland with a population of almost 100.000 residents, situated in the north of the Netherlands.



the operational processes that stakeholders have or need to have in order to realize their business needs. To this end, the teams are suggested to use the VIP framework to define a set of questions related to the VIP domains and components. The questions guided the teams to contemplate the operational arrangement of stakeholders, by focusing on, (1) the creation, provision and capture of *value* between stakeholders, (2) creation and exchange of *information* and information dependencies, and (3) the primary *business processes* between stakeholders. In a number of pages the VIP domains were separately described, analyzed and visualized. Eventually, the teams developed a VIP representation map to visualize their findings (Appendix A). As appendix A shows, the teams were free to intuitively and deliberately choose their own way of visualization. The reason was that the team members had no significant experience in modeling languages, and on the other hand, the creation of awareness of the VIP domains was the core intension of this experiment, rather than testing the expressiveness or comprehensiveness of particular modeling techniques. The diagrams represent a detailed description of interactions between stakeholders. The interactions are expressed in terms of values generated and exchanged between stakeholders, information resources that are exchanged or bartered between stakeholders, and the operational business processes that are share between stakeholders. Halfway through the first phase and during the second phase the teams were requested to update their VIP analyses, and if needed, revise them. On the end of the second phase the teams have written a report about the usefulness of stakeholder analysis, and particularly, the additional VIP analysis.

This research aimed to explore whether this extension positively impacts the projects along three dimensions, (1) improvement of the teams understanding about the stakeholders, (2) anticipation of potential inter-organizational conflicts, and (3) development of a viable, feasible and operational plan to move towards implementation of business objectives. As is suggested by Yin (1984), for an in-depth understanding of these dimensions, different project members were semi-structurally interviewed during the both phases. In this interviews the authors asked questions regarding teams understanding of stakeholders before and after using the VIP framework, whether the VIP framework specifically helped them to anticipate conflicts between stakeholders, and if the VIP framework supported them to formulate a well-defined business implementation plan.

In addition, the authors organized team meetings to observe ‘how teams apply the VIP framework’ and ‘how do they make decisions around stakeholder analysis’. By doing so, the authors could triangulate multiple data sources including team members report, interviews and observation memos (Yin, 1984). The authors analyzed the data by selecting and collecting the quotes that help to understand or answer the earlier arose questions.

The stakeholder analysis reports, mid-term reports, authors field notes, and the interview transcriptions are systematically reviewed by the authors of this paper. During the analysis the authors aimed to organize the data in such a way that it explains the three earlier discussed dimensions (and the related questions). To this end, authors have coded the data and structured it into different categories. To increase the intercoder reliability, both authors have analysed the data independently and negotiated afterwards to come to an agreement on codes and issues that these code can be associated with. A discussion about the VIP analysis reports, evaluation reports, interviews and notes, is provided in the next section.

## 6 Results

The analysis of data yielded two distinctive patterns of responses which are (1) the extension of stakeholder analysis, and (2) the complications of the proposed extended stakeholder analysis (Box 1 and

2). For the sake of space, we limit this section to the most essential issues that reoccurred in data. With regard to the former pattern, by using the VIP framework and making the VIP diagrams (appendix A), the teams were enforced to consider stakeholders' interactions and relations, their information resource dependencies, and primary business processes. Each team described and discussed the three domains of the VIP framework and its sub-components, and eventually, visualized their finding in several graphical representations. Moreover, dynamic interactions between different domains are analyzed and reported. The teams used the VIP analysis to understand stakeholders in operational terms, as well as, to analyze the implementation of their intended services. Confirmingly, the interview data shows that teams' experiences are generally positive. Interesting is that some of the VIP domains seem to be more useful than the other. Nevertheless, the combination of all three domains make it possible to represent a comprehensive and comprehensible view of the involved stakeholders, while the operational interactions, relations, dependencies and activities are explicated. Furthermore, the sequence, connectedness and complementariness of VIP domains and their components are positively perceived by the teams.

{source: team mobility - interview}

*"... the VIP analysis gave us a broad and factual view of the stakeholders interactions, which sometimes was in contrast with our intuitive image of the reality..."*

*"In our case, we wanted to know how and what values were exchange between actors. The analysis helped us to identify the dominant players, as it was needed for the design of technical criteria needed for the development of the intended service."*

{source: team health – interview}

*"The VIP model enforce you to think a bit deeper about the relationships between the stakeholders, especially their interdependencies..."*

*"In our project, the processes were very interesting for us, as we could use them to accurately position ourselves and our service in the wide network of actors..."*

*"... I personally, liked the connectedness of the VIP domains with each other."*

{source: team energy – interview / final report}

*"I think that without the model, we wouldn't think of dependencies between stakeholders in such detailed way! We have learned that stakeholder analysis goes beyond the identification of actors and drawing lines between them. Their relationships and dependencies are necessary to understand them (stakeholders) thoroughly..."*

*"The analysis gave us the chance to think how the business processes of different stakeholders could be connected to each other... The processes are intertwined with the information flow between the actors, so in our opinion, it was a logical component of stakeholders interactions."*

**Box 1:** Example quotes regarding the overall experience on the extended stakeholder analysis

Regarding the complications of the proposed extension, the data shows that the application of the VIP frameworks is not always straightforward (Box 2). The mobility team, for example, complained about the abstraction level of some concepts and definitions, such as value exchange. During the analysis the concept of value is interpreted in different ways. The team discovered that their stakeholders associate value with tangible and intangible benefits. Accordingly, team adapted their model to cover both types of values as well as the value objects relevant to each stakeholder. Furthermore, it was not always clear how detailed the concepts had to be described. Another issue was the teams' perceived relevance and usefulness that seems to vary in different context and phases of project in which the framework was applied. The team energy, for example, could not benefit from the analysis and framework in the second phase (i.e., implementation phase); however, the team health has successfully applied the analysis in both phases. The modeling technique to visualize the analysis and the VIP domains is yet another

troublesome issue. The teams applied their own intuitive approach to visualize the analysis, however, having homogeneous tooling to perform such visualization seems desirable.

{source: team mobility - final report}

*"...the difficulty in VIP model was the definition of the concepts such as value that could be interpreted in various ways. We had to define and provide our definition, together with the stakeholders, in order to apply VIP in a smooth way."*

*"...the value could be both tangible and intangible. In the context of smart merging, the security aspect as an intangible consideration, was a vital aspect that in some organizations even surpass the financial aspects. So, in our analysis we attempted to explicate and cover both types of values, while identifying the decisive value object for each stakeholder."*

{source: team energy – team meeting}

*"Our analysis was not really useful in the second phase of the project, since the requirements were translated into action points that had to be carried out in the second phase of the project."*

{source: team health- interview}

*"Oh yes! It was useful in both phases. Although more often the model was applied in the first phase to explore the network of stakeholders, we reconsidered the model in the second phase as well, to evaluate our service. We needed the analysis to reveal the patient groups and the related organizations and their relations and interactions."*

{source: team energy - interview}

*"...we just were a bit uncertain about the way of representation we chose to visualize our collected information, since different way of modeling are available, for example UML-kinds of modeling techniques."*

**Box 2:** Example quotes regarding complications of the extended stakeholder analysis

## 7 Conclusions

A host of publications on stakeholder analysis is rather concerned with abstract, often conceptual understanding of the analysis. Almost no explicit approach is provided in literature that systematically describes and analyzes stakeholders' dynamic interactions and dependencies in operational terms. So, many essential questions regarding operational arrangement of stakeholders remain underrepresented or implicit at best. Questions such as, which stakeholders (inter-organizational) interactions might be conflicting, what are the stakeholders' inter-dependencies, what are the constituting components of these interactions and dependencies, how are these interactions exchanged between stakeholders, how to deal with these dependencies, how does these interactions influence the viability, feasibility and sustainability of stakeholders' business model, and to what extent are these interactions and dependencies aligned with the underlying business processes. To demystify the stakeholders' operational interactions, this paper borrowed a generic analytical framework from the field of service innovation, which decomposes the stakeholders' interactions into three domains of 'Value' exchange, 'Information' exchange, and the primary 'Business Process'. This so-called VIP framework is applied to extend the stakeholder analyses that are conducted throughout three Smart Living projects. The qualitative evaluation of the three cases shows a considerable positive feedback regarding the framework's usability from the team members, an improved understanding of operational arrangement of stakeholders, and a simplified process of decision making with regard to business implementation plan. The VIP framework enabled the teams to develop a comprehensive view of stakeholders and explicate their interactions, relationships, dependencies and essential business processes in detail. The extended analysis helped the teams to improve their understanding of stakeholders, which has led to a more accurate decision making throughout the project. In addition, an increased alignment between the strategic planning and the operational implementation of strategy, i.e., the translation of strategy to operational activities and action points, was repeatedly recognized by the team members.

This paper has a number of limitations worthwhile to refer to. First, this study is based on few small cases. More cases would not only increase the studies validity but also our understanding of the framework's applicability and usefulness in other contexts. Also, the project members were students rather than experts or experienced employees. Furthermore, comparing the findings with a control group would have increased the case study reliability.

Besides, the case studies indicate a number of shortcomings regarding the application of the VIP framework, which can be used in the development of a VIP methodology. Examples are lack of a formal method to apply the model, open-ended definition of components, and lack of uniform visualization technique to model and visualize the results.

This paper must be considered as preliminary and illustrative attempt that modestly aims to attract attention towards a systematic analysis of stakeholders' dynamic interactions and dependencies on both business and operational levels. This paper argues that operationalization of stakeholders analysis is necessary to anticipate the stakeholders conflicting interactions and reveal the critical dependencies between them. In this regards, some suggestions for future research are (1) elaboration on stakeholder analysis operationalization, by means of the VIP model or any other comparable framework, (2) empirical evaluation of stakeholders analysis operationalization and its impact in a larger experimental setting, and (3) development of a modeling technique to integrate and visualize the stakeholders extended analysis.

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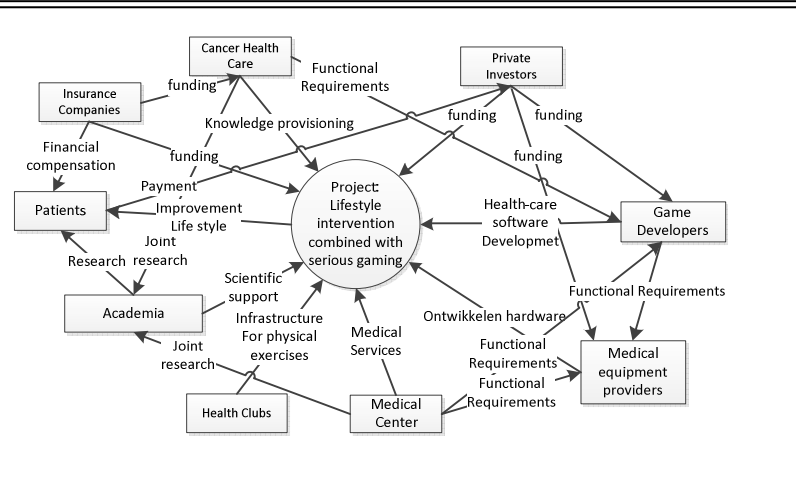
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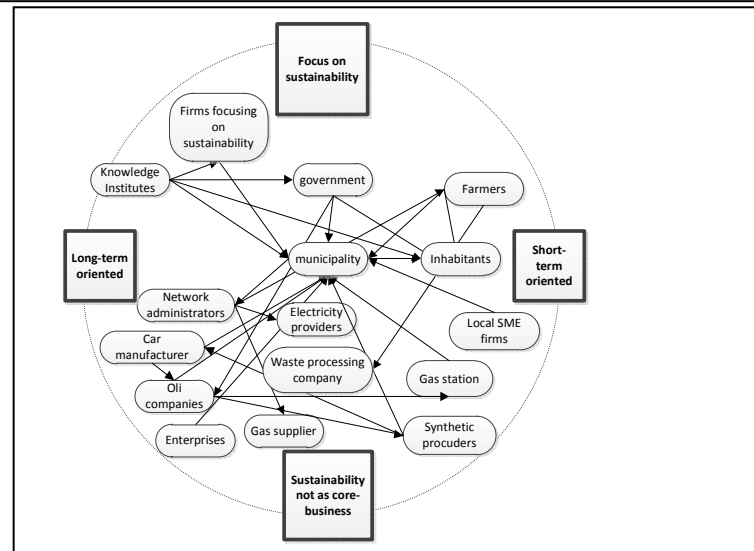
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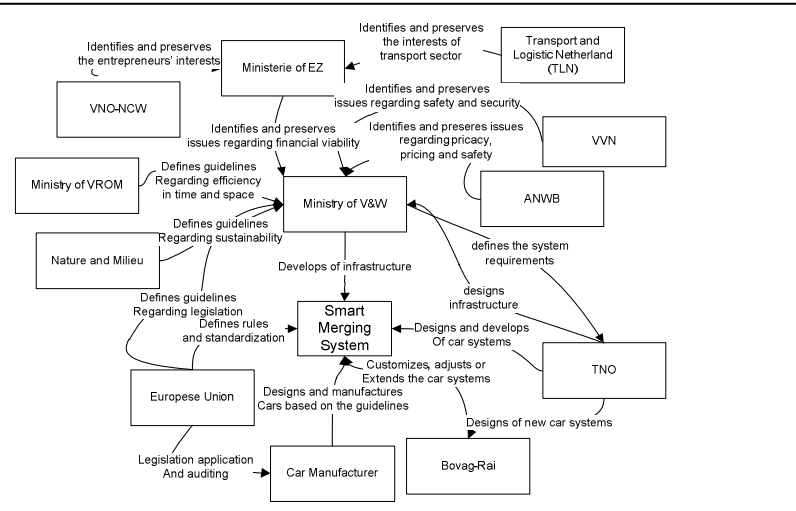
Appendix A. Three illustrative examples of graphical representation of Value, Information and Processes between actors (For the sake of space, three simplified diagrams are presented and discussed.)



This is one of the *Value diagrams* made by Health team. They intended to visualize the exchange of value object and value activities between different actors. The team also has made several value dependency schemes to identify the existing value dependencies between actors.



The diagram above is one of the *Information diagrams* made by Energy team. They first have analyzed the information flow and dependencies between actors, and subsequently, attempted to visualize the complex network of information/data exchange between various actors. The information links between actors are textually discussed in the stakeholder analysis report. In addition to the information flow, the diagram shows the position of actors with regard to two dimensions of sustainability and strategic orientation. These two dimensions were required to design and develop their integrative system.



This is one of the *Process diagrams* made by Mobility team. The team has identified the essential operational interactions between actors. This high level process model is elaborated to a more detailed diagram that describes how these actors interacts with each other and what business processes are essential with regard to the smart merging system.