Establishing Business Ecosystems for Smart Living services

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Establishing Business Ecosystems for Smart Living services

A case study on how to improve the robustness of the underlying networked Business Model

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Preface

As a final stage of the master's degree in Management of Technology at Delft University of Technology, I conducted an explorative study on how Business Ecosystems for Smart Living services with robust underlying Business Models can be developed. With a healthy dose of contentment, I present to you my thesis report as an output of the journey I went through during the past six months. I would like to express my gratitude to everyone that supported me throughout this period. A special thanks goes to my first supervisor, prof. Harry Bouwman, for his immense dedication from the beginning and his effective supervision and guidance throughout the process of conducting the research. You put a lot of effort in providing constructive feedback on my work and were always flexible in planning feedback sessions. This allowed me to critically reflect upon my work and contributed tremendously to the quality of this thesis report. I would also like to thank my second supervisor, Dr. Zenlin Roosenboom-Kwee, for her critical comments. This allowed me to reassess and improve the readability and argumentation of my work.

Having had the opportunity to conduct this research at Accenture has truly been my privilege. This allowed me to dive into the field of Smart Living and Business Models, while simultaneously gaining relevant working experience and getting to understand Accenture as an organization. For that reason, my gratitude goes out to the Accenture team. In special, I would like to thank my external supervisor, Menne Bos, for granting me the opportunity to conduct this research at Accenture and providing useful feedback during the course of writing my thesis. Your expertise and guidance provided me with valuable new insights and inspiration, which helped take my research to the next level.

Finally, a word of thanks goes out to my family for their support and involvement. A special thanks goes to my girlfriend, Madelon. Your patience, feedback, and unconditional support always helped me renew my energy and encouraged me to find new motivation.

Lennart Koorevaar

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Executive Summary

Smart Living falls under the broader rubric of Internet of Things (IoT) and is described as a residence with connected technologies that is able to anticipate and responds to occupants' emotional, rational, social, economic, and physical needs. In this research, Smart Living is divided into four domains: *comfort and entertainment*, *healthcare*, *safety and security*, and *energy management*. The creation of new cross-industry Business Ecosystems is inevitable for the launch of IoT initiatives, such as Smart Living service offerings (Dijkman et al., 2015). A Business Ecosystem, or Ecosystem, is a subset of a Business Model (BM) that is essential to devote attention to because it provides guidelines for how a network of firms can cooperate to realize a Smart Living service offering. This research addresses two proposed areas of research for the Smart Living sector (Solaimani et al., 2015b):

i. Business management: How can robust Business Models be developed?
ii. The networked enterprise: How can strategic collaborations be established?

How robust BMs can be developed is a key question that this research focuses on. Therefore, BM robustness, which is defined as BM viability and feasibility on the long term, is set as dependent variable. Because Smart Living services have a networked nature, collaboration between partners in the business environment is essential. This necessitates the formation of a network of firms that collaboratively pursue to formulate and implement a networked (i.e. constituted by multiple actors in an Ecosystem) and robust BM. Specifically, what is lacking in academic literature is a dynamic view on networked BMs. There is not yet an approach with which the interdependencies and relationships between different Ecosystem actors are modeled in a dynamic way to analyze Ecosystem partner alignment and to improve BM robustness (Walenkamp et al., 2012). Hence, the central research question is as follows:

'How can a Business Ecosystem for Smart Living services be established that ensures a robust underlying Business Model?'

Since telecom operators provide connected services directly to customers and have experience with consumer engagement, they are suitable parties for commercializing Smart Living services. They however lack expertise and legitimacy to offer these services individually and must deal with other types of industries that have ambitions to play roles in new Smart Living business initiatives. Together with partners, KPN launched such a Smart Living service, called KPN SmartLife. This service was unsuccessful at realizing large scale diffusion. From that perspective, focusing on this service was of interest for this research. A research case relating to the safety & security domain of Smart Living was selected, which is similar to the KPN SmartLife service. The key difference is that the service includes an additional role: the role of insurance provider. To answer the central research question, a process framework with BM tooling was established, which was subsequently applied to the research case. For this, thirteen semi-structured interviews were conducted with BM tooling experts, industry experts, experts with individuals in organizations that could fulfill key Ecosystem roles, and interviews to validate the results. The results were also validated by making comparisons with relevant academic literature (Nikayin, 2014; Solaimani, 2014; Frijns, 2016). As primary problem owner, Accenture sought a generic approach for how to establish an Ecosystem. Additionally, Accenture was interested in key learnings regarding KPN SmartLife. This is because it took the lead in setting up this service. The process framework that is core to the research is however developed for initiators of Smart Living services in general. The *executive* is thus defined as *initiators of Smart Living services*.

The process framework serves as a guideline to establish a robust and networked BM with which an Ecosystem of actors can collaboratively offer a Smart Living service to targeted market segments. The Service, Technology, Organization and Finance (STOF) ontology (Bouwman et al., 2008) was introduced to formulate the networked BM. The Partner Value Matrix (Haaker et al., 2018) was used to establish partnerships between actors by visualizing the logic of each partner to cooperate. In line with the central research question, the focus is on the Smart Living Ecosystem, which means that the *Organization* domain of the STOF ontology was focused on. As an extension of this domain, the Value, Information, and Processes (VIP) framework (Solaimani, 2014) was introduced. This framework was integrated with a System Dynamics (SD) approach to evaluate and improve the alignment of partners' interdependencies and interactions. Causal diagrams, as part of the SD approach, show the causality between VIP-related variables in different scenarios. The nature of these scenarios can be a static (i.e. non-time-related) perspective, but causal diagrams are particularly relevant when seeking to comprehend dynamic (i.e. time-related) interactor relationships. The *value attributed* by Ecosystem actors to the service, or certain features of it, is a fourth component that was introduced on top of the value exchanges, information exchanges and business processes. Causal structures can be used to explore this *attributed value* and how this value builds up over time due to reinforcing feedback loops. This generates a link with the starting point of the STOF ontology: the service should generate value for both consumers and service providers. To resolve the identified misalignments and conflicts, activities were devised to better align Ecosystem actors and to adapt the underlying BM with the objective of improving its robustness. Strategies from literature (Abdelkafi & Täuscher, 2015) were used to guide the process of finding activities to improve BM robustness.

Six scenarios were analyzed using causal diagrams. This exposed the advantages and disadvantages of the integrated VIP framework and SD approach. SD helps overcome bounded rationality by visualizing these causal structures. Although the process of establishing the causal diagrams is time-consuming, they help understand causal relationships between VIP-related variables, allowing for scenario analysis and better-informed decision making. Causal diagrams only visualize causal relationships and not other types of relationships between variables. This results in a non-fully comprehensive picture of the relationships between variables in the Ecosystem. The approach does however present a means to record Ecosystem dynamics, allowing actors to discuss the truthlikeness of the scenarios considered. They can come to an agreement in these discussions and, step by step, delve further into the causal structures. Because the quantitative phase of SD was left outside the scope of the research, no conclusions were drawn regarding the *elasticity* and *strength* of the causal relationships in the causal diagrams, and the extent by which the BM robustness is improved because of the presented activities. Various examples of interactor alignment, misalignments and conflicts were identified by means of six causal diagrams. Subsequently, four activities were introduced to resolve the misalignments and conflicts, and enhance the robustness of the underlying BM. These activities are: *incentivize data sharing by variable insurance premiums*, *establish an all-in contract with the security provider*, *simulate scenarios in trial phase*, and *exclude sensor equipment from the service offering*.

The limitations of the research are as follows. Following literature on case studies (Sekeran & Bougie, 2016; Yin, 2013; Cunningham, 1997; Stake, 2008) it can be concluded that qualitative case studies are not easily generalized to other settings, are hard to replicate, and the results are dependent upon the perceptions of the researcher. It proved to be challenging to make interviewees reflect upon VIP-related variables and the causality between them. Especially the more complex causal structures are hard to establish without using supporting instruments, such as a notepad. Also, the activities to resolve the misalignments and conflicts were not established *using* the causal structures, which is the intention of the approach. Also, because interview candidates were only interviewed once, it was not possible for them to sequence activities to eliminate VIP-related misalignments and conflicts in a BM roadmap. Next, because the case study was mainly focused on evaluating the process framework –

particularly the integration of the VIP framework and SD approach – not all of the interactor misalignments and conflicts for the research case were presented. Finally, part of the actors' perspectives on Ecosystem dynamics is missing because of participation issues with the dedicated KPN departments for Smart Living services.

A recommendation for future research is to explore how this approach can be converted from qualitative to quantitative. For this, an option is to follow the entire SD procedure rather than just the qualitative phase. Another recommendation for future research is to find dedicated tools for the evaluation of the alignment of strategic objectives, the complementation of capabilities, and the degree of trust between Ecosystem actors. In this research, the integrated VIP framework and SD approach were used to evaluate these features. At this point it is however not clear if these are adequate tools to fully comprehend these dynamics. Finally, apart from the phase in which the roles are defined, the process framework is generic and not specifically usable for Smart Living or even IoT services. As long as a comprehensive overview can be made of the required roles, the framework could also be used for other types of services. A recommendation for future research is to evaluate the usability of this framework for other types of services for which Ecosystem dynamics are essential.

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1. | Introduction

This research harmonizes Business Models (BMs) with the concept of Smart Living. An introduction to this topic is given in the first paragraph (*see paragraph 1.1*). Next, the problems that emerge within this field of study and corresponding knowledge gaps are introduced (*see paragraph 1.2*). Based on these knowledge gaps, the research objectives are presented (*see paragraph 1.3*). What follows is the central research question with which the research objectives can be achieved (*see paragraph 1.4*). The chapter concludes with the structure of the thesis report (*see paragraph 1.5*).

1.1. Introducing the topic

Smart Living and Business Models cannot remain undiscussed before introducing the research problems. This paragraph therefore elaborates on Smart Living (*see paragraph 1.1.1*) and Business Models (*see paragraph 1.1.2*).

1.1.1. Smart Living

Business executives and researchers have been focusing on the Smart Living sector for over forty years (Solaimani et al., 2010). As made clear by Solaimani et al. (2015b), a variety of fields of study are operating in this domain: mobile computing, artificial intelligence, robotics, and service engineering. These fields of study combine forces to provide solutions aimed at improving residents' quality of life by transforming the home environment into a more comfortable space to live in (Bierhoff et al., 2007). As is discussed later (*see paragraph 3.1*), this transformation is shaped by several solutions, which can be divided into four main domains: comfort and entertainment, safety and security, healthcare, and energy management. Below, the key benefits of each of these domains are summarized. The third chapter (*see paragraph 3.1*) discusses these benefits elaborately.

- *Comfort & entertainment domain*: remote control, and automation and customization of tasks to user preferences.
- *Healthcare domain*: disease prevention, reduction of social isolation, and enhanced cost-effectiveness of healthcare.
- *Safety & security domain*: access control and smart monitoring of the home environment.
- *Energy management domain*: control and conservation of energy, and higher efficiency and reliability.

According to Bierhoff et al. (2007) the general objective of these service offerings is to enable residents to address their emotional, rational, and social needs. Arguably, since Smart Living solutions allow for energy conservation and disease prevention, respectively, economic and physical needs are also addressed. In this thesis report, the term service offering encompasses a combination of certain (Smart Living) products and services. This is because, ultimately, products also provide a part of a service. The next section explains how Smart Living falls under the broader rubric of Internet of Things (IoT).

Internet of Things

This research concentrates on Smart Living, which is one of the IoT domains. Dijkman et al. (2015) refer to IoT as the '*interconnection of physical objects, by equipping them with sensors, actuators and a means to connect to the Internet*' (p. 672). According to Dijkman et al. (2015), IoT inspires new business processes, BMs and relationships, and involvement of different partners. Hence, the

creation of new cross-industry Business Ecosystems is inevitable for the launch of IoT initiatives. This is elaborated on in the next paragraph (*see paragraph 1.1.2*). The next section explains the motivation for telecom operators to offer IoT services.

Telecom operators

Referring to the definition of IoT, it can be concluded that connectivity is key. As telecom operators provide connected services directly to customers and business, they are a key enabler of IoT service offerings. Moreover, as telecom operators have experience with exploring drivers for consumer engagement and making service offerings in general, they are suitable parties for commercializing IoT service offerings. Also, academic literature states that telecom operators have been subject to shifts in revenues and are required to innovate their BMs to start offering innovative services (Ballon, 2009). This topic of BMs is elaborated on in the next paragraph (*see paragraph 1.1.2*). In line with this reasoning, the third chapter (*see paragraph 3.2.3*) further argues why particularly telecom operators are inclined to provide Smart Living offerings on top of their traditional services.

1.1.2. Business Models

As is discussed in a later paragraph (*see paragraph 2.1.1*), academic literature provides several definitions of a BM. It later becomes clear that the focus of this research is on *networked* BMs, i.e. BMs constituted by multiple actors operating in a Business Ecosystem. Therefore, a combined and slightly adapted version of the definitions by Shafer et al. (2005) and Winter & Szulanski (2001) is used:

'In a networked setting, a Business Model is a representation of a Business Ecosystem of firms' underlying core logic and strategic choices for establishing inter-organizational architectures that create and capture value collaboratively and distribute this value among each other.'

Business Ecosystems

A *Business Ecosystem*, from now on *Ecosystem*, is a subset of a BM (Hamel, 2010) that is essential to devote attention to because it provides guidelines for how a network of firms can cooperate to realize a (Smart Living) service offering. De Reuver et al. (2008) describe a Value Network, or Ecosystem, as *'a dynamic network of legally independent, collaborating actors who intend to generate customer value and network value by means of a specific service offering, and in which tangible and intangible value exchanges take place between the actors involved'* (p. 135).

Networked Business Models

With the development of IoT technologies (Dijkman et al., 2015), the contemporary economy experiences a trend of increasing complexity and networkedness (Lindgren et al., 2010). Because of this trend, the essence of Business Models is shifting from a blueprint of how one individual company does business, as stated by Gordijn & Akkermans (2001), towards a blueprint of how partners in an Ecosystem do business collectively and create synergetic benefits by complementing each other's skills and competencies (Lindgren et al., 2010). A networked BM potentially has a high degree of innovation, since it has a larger pool of competencies and ideas and makes more products and markets available for the Ecosystem as a whole. From an individual actor's perspective, the development of a networked BM is therefore argued to be an adequate way to innovate. This is particularly the case when actors acknowledge that they could reap more value from complementing their competencies and establish partnerships instead of developing the required competencies individually. In the next two chapters, it becomes clear that Smart Living is one of such cross-industry domains that requires cooperation and complementation of resources of various actors.

Business Model Innovation

Business Model Innovation (BMI) is central to this research. BMI refers to the renewal of the logic by which value is captured and created for the intended market segment(s) (Björkdahl et al., 2013). To elaborate on the focus of the research, a distinction is made between the exploration of new business ideas and the exploitation of existing ideas. Whereas exploration relates to the possibilities for new business ideas, exploitation relates to how these ideas can be exploited by commercializing service offerings. As discussed in further detail in upcoming paragraphs, this research takes off from a position where the new business idea already exists and where Ecosystem actors are trying to align with each other to exploit this service offering. It is therefore at the transition point from the *exploration* to the *exploitation* phase. In this process, however, actors encounter misalignments and conflicts in their interdependencies and interactions. Resolving these issues may require updating of the underlying BM and the business idea (the Smart Living service), which again relates to the *explorative phase.* This proves that the transition from *exploration* to *exploitation* is not necessarily a linear process. Another type of non-linearity is visualized in the below figure (*see Figure 1*). This figure shows that the service offering evolves along with the development of the BM and continuous validation by consumers in a series of iterations (Haaker et al., 2018). Conclusive, a networked BM is subject to and shaped by continuous validation by Ecosystem actors and consumers.

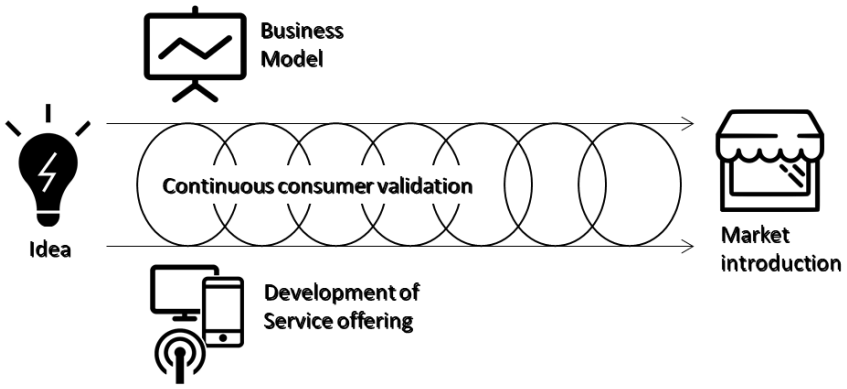

Figure 1 – Business Model Innovation process. Adapted from: Haaker et al. (2018).

1.2. Research problems

The objective of this paragraph is to address the relevance of the commercialization of Smart Living initiatives and research into this domain (*see paragraph 1.2.1*). Next, the academic problems and knowledge gaps (*see paragraph 1.2.2*) and the practical problems (*see paragraph 1.2.3*) regarding the topic are discussed.

1.2.1. Relevance of Smart Living initiatives

Hindus (1999) calls for academic and practical interest into the Smart Living sector for several reasons:

- In line with the argumentation of Bierhoff et al. (2007), Hindus argues that it is a rich field of research that can potentially enhance the quality of life of millions of individuals.
- Technology is already widely, and increasingly, adopted in home environments for communication, entertainment, and household infrastructure purposes.
- The growth of technologies within residencies cannot be ignored from an economic perspective. Smart Living technologies have the potential of producing billions of Euros in revenue.

Although this paper dates from 1999, the arguments for why Smart Living research should be conducted still hold and are therefore still relevant today. Lives of millions of individuals can still be improved as Smart Living solutions enable residents to address their emotional, rational, social, physical and economic needs (*see paragraph 1.1.1*), and firms can generate new sources of revenue by offering these services. This is particularly relevant because numerous Smart Living technological concepts already exist, but an integrated Smart Living initiative has not yet been commercialized on a large scale, and many Smart Living initiatives fail. The next paragraph further delves into this.

1.2.2. Academic perspective

Academic problems

Despite the motivations for academic and practical interest, and the fact that houses are equipped with an increasing number of smart devices, the Smart Living concept has barely ever been realized on a large scale, and the services and products offered by different providers are often not integrated (Solaimani et al., 2010). To date, Smart Living research initiatives and concepts in general have been primarily technology-push-driven. There are various explanations for this reality (Solaimani et al., 2015b):

- Smart Living is a domain in which technicians are highly represented.
- Acquisition of funding is easier for technical than socio-technical or socio-organizational research.
- The existence of various technical conferences stimulates the technological focus.
- Most Smart Living experiments are predominantly performed in an R&D setting.

Despite this technological focus, from a technological viewpoint, the fact that the Smart Living concept has barely been realized on a large scale is a consequence of the absence of a platform that integrates its features, the lack of an inter-industry standard, incompatible infrastructures and rapid advancement of new innovative concepts (Solaimani et al., 2010). From a strategical viewpoint, this is caused by strategic deliberation and lack of alignment of interest, BMs and business processes of the actors concerned during the implementation of these large-scale projects (Solaimani & Bouwman, 2012). The latter viewpoint is what this research concentrates on.

Knowledge gaps in academic research

As argued in the previous section, continued disregard of research on strategic alliances and BMs impedes the commercialization of Smart Living technologies and services on a large scale, and thus the advancement towards a more mature Smart Living market. Solaimani et al. (2015b) suggest four areas on which new research initiatives should focus:

i. Business management: How can robust Business Models be developed?
ii. The networked enterprise: How can strategic collaborations be established?
iii. Strategic Ecosystems: Which roles will become key?
iv. Service marketing: What is the market demand?

How robust BMs can be developed is a key question that this research concentrates on, which is why BM robustness is set as *dependent variable*. Bouwman et al. (2017) define a *robust BM* as a BM that is both viable and feasible on the long term. BM feasibility describes how well a BM can function in a prospective environment and BM viability describes how financially sustainable a BM is.
Another gap raised is that academic literature on *networked* BMs is scarce (Heikkilä & Heikkilä, 2013). Lindgren et al. (2010) argue that establishing networked BMs is a complex endeavor but of vital importance for the endurance of many firms. Because Smart Living offerings have a networked nature (*see paragraph 1.1.2*), collaboration between partners in the business environment is

essential. This necessitates the establishment of a network of firms that collaboratively pursue to formulate and implement a *networked* and *robust* BM. Specifically, what academic literature currently lacks is a dynamic view on networked BMs. There is not yet an approach with which the interdependencies and relationships between different Ecosystem actors are modeled in a dynamic way to analyze Ecosystem partner alignment. This knowledge gap aligns with that presented by Walenkamp et al. (2012), who state that dynamics in BMs and a prescriptive approach to tackle uncertainty and prospective BM robustness is lacking.

The reorientation towards networkedness, i.e. the partnerships that Ecosystem actors engage in, inevitably also touches upon the second area of future research as listed above: how can strategic collaborations be established? This area of research is reconcilable with the first because Solaimani et al. (2010) argue that the viability of a Smart Living initiative, and the robustness of the corresponding BM, might be limited if insufficient attention is paid to Ecosystem partnerships and partner involvement from the beginning. Since more attention to these partnerships is conducive to the development of robust Smart Living BMs, and a BM's robustness is considered a prerequisite for its effectiveness (Bouwman et al., 2008), the establishment of such a BM contributes to the maturation of the Smart Living sector. This maturation, in turn, enables the benefits of Smart Living solutions, as described in the previous paragraph (*see paragraph 1.2.1*). It should however be noted that a robust BM does not ensure a successful rollout of service offerings and excellent firm performance, since there are various other factors that contribute to this (Casadesus-Masanell and Ricart, 2007). After commercialization, such an offering will prove unsustainable if the BM, or strategy for that matter, are insufficiently differentiated from that of competitors, or if a firm fails to execute the BM in an efficient way. In other words, robust BMs contribute to, but do not guarantee, the successful and fully-fledged commercialization of Smart Living service offerings.

Next, no guidelines have been provided yet for the *implementation* of the networked BM. This implementation also contributes to the maturation of the Smart Living sector, as discussed above. BM implementation is the creation and application of activities or policies to effectuate the BM (Solaimani et al., 2015a). An essential part of the gap in the academic literature on *networked* BMs is how to make the transition from an existing (as-is) to the newly defined (to-be) networked BM (de Reuver et al., 2013). If this transition is managed by multiple players, issues of trust, transparency, and collaboration can become a significant hindrance to the rollout of the service offering (Groenveld, 2007). Proper coordination during the BM implementation process is therefore essential.

1.2.3. Practical perspective

Since the research uses a case study approach, the objective is to fill the gaps in the academic literature by formulating a relevant research case. The basis for this research case is the Smart Living service of telecom operator Royal KPN N.V.: *KPN SmartLife*. The research is conducted at Accenture. Therefore, the practical problems of both KPN and Accenture are relevant for this research and are described next.

KPN

As mentioned before (*see paragraph 1.1.1*) telecom operators are designated to explore Smart Living business opportunities. KPN is a Dutch incumbent telecom operator that, in 2015, launched its KPN SmartLife service. This service was unsuccessful at realizing large scale diffusion. From the perspective of KPN, the question is what the reasons are for this fact. For that reason, the research case takes the perspective of KPN. Their interest in renewed Smart Living services can be examined from two perspectives: the top-down and bottom-up perspective. From the bottom-up perspective, the strategic focus is on increasing KPN's general customer base for telecom services and, in the context of this research, how Smart Living services can contribute to this growth. The top-down

perspective, on the other hand, starts with the Smart Living service offering and explores how value is generated from this service offering for customers and other Ecosystem actors.

From a *bottom-up perspective*, KPN's current focus is on improving network connectivity (e.g. by fiber and 5G) for its customers. This is a response to customers' desire to be connected throughout the house, but also outdoors. From this perspective, it is relevant to think of which (Smart Home) services fit this transition towards enhanced connectivity. Since KPN provides service offerings to the mass market, the question is raised which Smart Living services KPN could offer that address the mass market currently. From the bottom-up perspective, KPN concludes that the timing is not right, and extensive Smart Living service offerings should thus not be concentrated on currently. If the decision were to be made to renew or scale up Smart Living services, it must become easier to integrate new services, making it possible to quickly expand the proposition. This also necessitates that the establishment of new partnerships is done more quickly and at low cost. From a *top-down perspective,* KPN notices shifts in revenues, which could be countered by diversifying their range of services, including Smart Living services. This approach centralizes the *value* that Smart Living offerings can offer to consumers, rather than taking the objective of consumer base expansion as a starting point. From this perspective, it can be concluded that customers have an interest in automation, and demand is currently highest for maturing technologies such as smart lighting and smart thermostats.

Accenture

Since this research is conducted at Accenture, its practical contribution to Accenture is also relevant. What is striking is that the argumentation of Heikkilä & Heikkilä (2013) is in line with Accenture's desires. Accenture lacks a generic approach for how to establish an Ecosystem. This approach should provide guidelines for how to select Ecosystem partners, how to define their roles, and how to ensure that their resources, competencies, and strategic objectives complement each other. Apart from that, Accenture is interested in the key learnings about the establishment of Ecosystems in general that this research will provide. Finally, Accenture took the lead in setting up the KPN SmartLife service. For that reason, just like KPN, Accenture is interested in key learnings regarding KPN SmartLife.

1.3. Research objectives

In line with the knowledge gaps raised in academic literature, this research intends to explore how a robust networked BM for Smart Living offerings can be established. Since the Ecosystem is an essential subset of a BM that is specifically relevant for the Smart Living sector and to Accenture, the research concentrates on how strategic collaborations for Smart Living offerings can be established. The two areas of research of robust BMs and strategic collaborations are thus reconciled in this research. Specifically, this research intends to introduce an approach with which the interdependencies and relationships between Ecosystem actors are modeled dynamically. In doing so, the alignment, misalignments, and conflicts between Ecosystem actors are analyzed. The misalignments and conflicts can be eliminated by introducing activities to adapt the underlying BM; improving partner alignment and the robustness of the BM. In this BMI approach, *the BM of a service offering as constituted by an Ecosystem of actors* is the unit of analysis, and the dependent variable is the *robustness* of this BM.

1.4. Research questions

This paragraph describes the central research question (*see paragraph 1.4.1*), and the supporting questions (*see paragraph 1.4.2*).

1.4.1. Central research question

In line with the research objectives, the central research question is as follows:

'How can a Business Ecosystem for Smart Living services be established that ensures a robust underlying Business Model?'

1.4.2. Supporting questions

Next, six supporting questions are introduced, which constitute a step by step approach to answer the central research question in a structured way. The supporting questions are as follows:

1. *What BM tooling relevant for the central research question can be found in academic literature?*

The first step in answering the central research question is to introduce BM tooling relevant for the research objectives. This tooling is derived from academic literature. A process framework is introduced which includes BM tooling for the establishment of an Ecosystem and a robust underlying BM.

2. *How can the process framework be specified to the Smart Living sector?*

Next, it is assessed how the process framework can be made suitable for the Smart Living sector, specifically. To do so, Ecosystem roles that are specifically relevant for a Smart Living service are defined.

3. *How can the process framework be used to constitute a more robust networked Business Model for Smart Living?*

In answering the first supporting question, tooling is introduced that is to be applied in novel ways. This supporting question explores how this can be done in order to establish a robust and networked BM. The fundamental approach introduced to analyze and improve partner alignment and develop a robust networked BM is the combination of a System Dynamics (SD) modeling approach and the Value, Information and Processes (VIP) framework. This is elaborately discussed in later paragraphs (*see paragraph 2.4*).

4. *How can the process framework be used to implement this more robust Business Model?*

As part of answering the first supporting question, BM roadmapping (de Reuver et al., 2013) is introduced to establish and sequence the activities to make the transition from an as-is BM to a more robust to-be BM (*see paragraph 2.5*). There are however challenges for applying this BM roadmap in a *networked setting* that must be considered. Originally, the approach is mainly used for a *single-firm* perspective. The roadmapping process is applied in a novel way, as it purely focuses on sequencing activities to align Ecosystem partners, resulting in a more robust networked BM. Determining how this can be done is what this supporting question delves into.

5. *Which tooling is still missing for realizing the research objectives?*

The next step is to evaluate which BM tooling is still missing for realizing the research objectives. This is investigated to evaluate the completeness of the process framework.

6. *How can the process framework be applied to the research case?*

Since the research case takes the perspective of KPN, the research case is based on KPN's current Smart Living service, KPN SmartLife. A service comparable to KPN SmartLife is used for the research case. This service offering touches upon one or more of the four Smart Living domains (*see paragraph 1.1.1*). Finally, the process framework that was established by answering the above supporting questions is applied to this research case to draw conclusions regarding the usefulness of the framework and corresponding BM tools.

1.5. Thesis structure

The thesis report includes the following chapters:

- Chapter 2 presents the theoretical framework in which the process framework is introduced and discussed in detail.
- Chapter 3 delves into the Smart Living research domain and the potential roles within it.
- Chapter 4 introduces the research methodology.
- Chapter 5 elaborates on the findings of the research.
- Chapter 6 draws conclusions by answering the central research question. It also discusses the contributions and limitations of the research and the recommendations for future research.

2. | Theoretical framework

This chapter kicks off with the introduction of a process framework with which an Ecosystem of actors can establish a networked BM. Heikkilä & Heikkilä (2013) present such a framework. They argue that gaining insight into this creation process guides the process of establishing a networked BM, and exposes which decisions promote or inhibit the collaborative development of this BM. Since the framework is not officially named, within this thesis report it is referred to as the Heikkilä Joint BM Framework. Because of the extensiveness of the framework, it is described in the appendix (*see appendix I*). Based on this literature, and in line with the central research question and supporting questions, this chapter presents a process framework which serves as a guideline to establish a robust networked Business Model with which an Ecosystem of actors can collaboratively provide a Smart Living service offering to targeted market segments. It assumes the below structure (*see Figure 2*). Corresponding paragraphs for this chapter are also included in the figure.

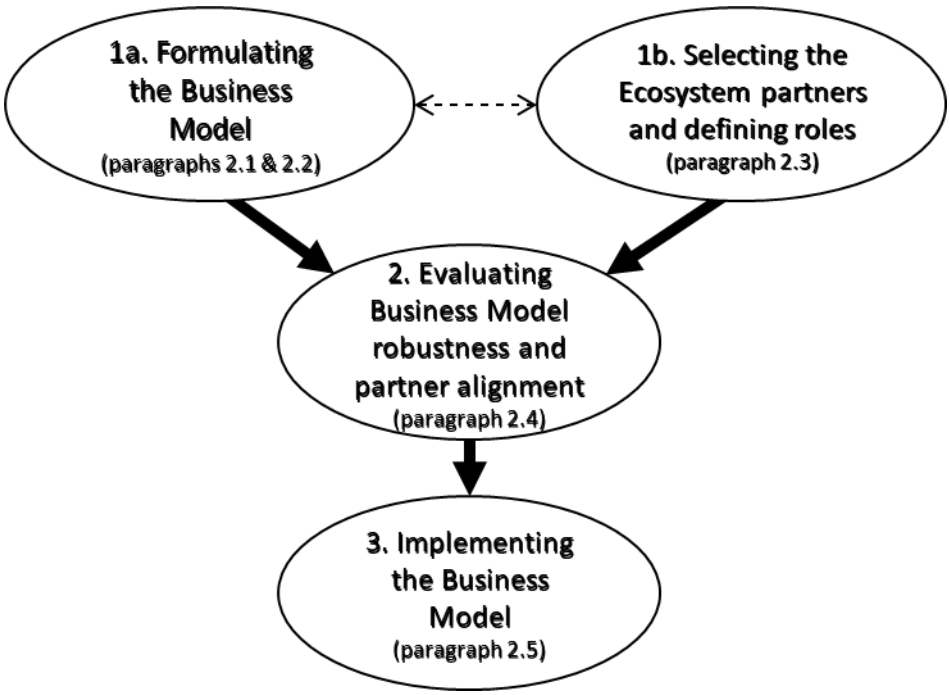

Figure 2 – Process framework.

This framework differs slightly from the Heikkilä Joint BM Framework. In the latter, BMI starts from a service offering that taps into customer needs, and thus offers *value* to consumers. This research starts from a service offering that is of interest to KPN; thereby not concentrating on the exploration phase but on the transition from the exploration to exploitation of the business idea, as explained earlier (*see paragraph 1.1.2*). Similar to the Heikkilä Joint BM Framework, the partner selection and BM formulation process stages are executed in parallel. After these two stages, the process reaches the BM robustness and partners alignment evaluation stage. Here, SD is presented as an approach that can be integrated with the VIP framework to evaluate partner alignment and BM robustness. The final stage is the implementation of the BM, for which BM roadmapping is used. This sequence of stages covers the two key objectives of this research: development of robust BMs and formation of strategic collaborations for Smart Living service offerings (*see paragraph 1.2.2*).

1a. *Formulating the Business model*. The increasing attention to the need for networked BMs (Lindgren et al., 2010) calls for the elaboration of theory on both BMs and Ecosystems. The Business Ecosystem is a subset of a Business Model (Hamel, 2010) that is essential to devote attention to because it provides guidelines for how a network of firms can cooperate to realize a service offering. Therefore, BMs and Ecosystems are what the first two paragraphs (*see paragraph 2.1 and 2.2*) of this chapter delve into.

1b. *Selecting the partners and defining roles*. Despite the scarcity in literature of tools with which partners can be selected, and roles can be divided, the third paragraph (*see paragraph 2.3*) introduces the Partner Value Matrix for this cause. This tool defines the mutual benefits of the cooperation for each actor involved. It describes this at a general level but has its limitations. The networked BM is for a large part *defined* by which partners are included in the Ecosystem and what their roles are. For that reason, this stage is done in parallel and is highly intertwined with the BM formulation stage (stage 1a).

2. *Evaluating Business Model robustness and partner alignment.* BM robustness is a prerequisite for the effectiveness of a BM (Bouwman et al., 2008). A combined approach of the VIP framework and SD is introduced to evaluate partner alignment and robustness of the BM. The fourth paragraph of this chapter (*see paragraph 2.4*) delves into this.

3. *Implementing the Business Model*. BM roadmapping is a tool to make the transition from an existing (as-is) to the newly defined (to-be) BM (de Reuver et al., 2013). Academic literature on this process in a networked setting is scarce. This is discussed in the fifth paragraph (*see paragraph 2.5*).

Finally, the final paragraph (*see paragraph 2.6*) concludes this chapter.

2.1. Business Models

The concept of BMs in relation to Ecosystems is discussed next. First, BMs are defined, and the difference between a conventional and a *networked* BM (i.e. a BM constituted by an Ecosystem of actors) is explained (*see paragraph 2.1.1*). Next, the concept of BMI is further elaborated on (*see paragraph 2.1.2*). Finally, BM ontologies (*see paragraph 2.1.3*) and the VIP framework (*see paragraph 2.1.4*) are introduced.

2.1.1. Defining Business Models

Definitions of a Business Model

Shafer et al. (2005) define a BM as '*a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network*' (p. 202). This definition is aligned with that of Perkmann & Spicer (2010). They define BMs as *'performative representations that articulate and help instantiate the value of a technology'* (p. 2). Both definitions centralize the creation and extraction of *value*. According to Amitt & Zott (2010), a BM captures how a firm, having a specific technology, can constitute an organizational architecture and ties with external stakeholders in a successful way. Winter & Szulanski (2001) conceive of BMs as means for arranging and developing organizations. BMs are interpreted as templates with which the elements of an organization can be structured. A salient feature of the last two definitions is that they centralize the *organizational* aspect of BMs.

Business Model, Strategy and Processes

The term 'Business Model' is regularly used interchangeably with the term 'Business Strategy' (Zott & Amit, 2008). This mix-up of terms is, however, erroneous. As visualized in the figure below (*see Figure 3*) in a networked setting, a BM is a means to translate the strategic objectives of an Ecosystem of partners (Walenkamp et al., 2012). It describes *what* the partners should do to capture and deliver value. Operational business processes of the Ecosystem partners, along with their information and value exchanges, describe *how* this should be done. The below overview is relevant because later (*see paragraph 2.1.4*) the VIP framework is introduced, which aims to connect the Business Strategy, the BM and business processes (Solaimani et al., 2015a).

Figure 3 – Relation between Business Strategy, Business Model and Business Processes. Adapted from: Al-Debei and Davison (2010).

Networked Business Models

Now that BMs in general have been elaborated on, this section discusses networked BMs in further detail. As mentioned in the previous chapter (*see paragraph 1.1.2*), most current BM literature focuses on individual firms (Zott & Amit, 2010; Lindgren et al., 2010). However, firms in most sectors have shifted their focus from competition on both effectiveness and efficiency to accelerated innovation (Moore, 2006). In doing so, they often realize that the innovative concept cannot be developed individually but requires complementation of resources from multiple entities. To remain competitive or to generate new offerings, these competencies can be complemented by knowledge institutions, suppliers and customers, and competitors (Lindgren et al., 2010). Also, it is becoming increasingly difficult for firms to compete with others individually. Cooperation between firms can reduce the costs of investment and enhance firm competitiveness (Chen & Karami, 2010). Cooperation can also reduce technical complexity and enhance flexibility for customers (Feng, 2010). Finally, potential levels of innovation are higher in a collaboration, as it forms a larger pool and variety of competencies, technologies, products, services, markets and industry sectors to draw from (Lindgren et al., 2010).

For these reasons, firms are forced to be open to the development of network-based innovations to survive. Correspondingly, many present-day BMs are constituted by a multitude of firms operating in an Ecosystem (Zott & Amit, 2010). In recent years, the BM concept has transformed from a plan for how one single firm does business (e.g. Gordijn & Akkermans, 2001) into a blueprint that visualizes how partners in a network do business collectively and create synergetic benefits by complementing their skills and competencies (Lindgren et al., 2010). As the economy is growing to become more networked, the need for networked BMs is increasing. Relevant concerns for the development of an effective networked BM are: how to establish revenue division and charging structures, and how to set up a business partner network that covers the required business activities (Tian et al., 2008). As is further explained in a later paragraph (*see paragraph 2.2.4*), how resources, knowledge, and capabilities are shared across firm boundaries is a key issue here (Heikkilä & Heikkilä, 2013). Also, partners each have their own competencies and are driven by their individual success criteria (Lindgren et al., 2010). The individual firms' involvement in the initiative is driven by the prospect of the extent to which these criteria will be satisfied. Therefore, a significant challenge during the establishment of a networked BM is the complementation of these competencies and the alignment of these success criteria. Limitation of network size reduces this challenge and, in larger networks, one of the partners should act as a leader. To sum up, the realization of innovation in an Ecosystem

requires the establishment of a *networked* BM that is supported by *all* the partners in the Ecosystem. These aspects should be considered when developing a networked BM for Smart Living offerings.

Reformulating the definition of a Business Model

Considering the above information, and keeping in mind the fact that this research centralizes how an Ecosystem of actors can set up an organizational structure to create and obtain value from their offerings, and how they can distribute this value, the BM definitions provided by Shafer et al. (2005) and Winter & Szulanski (2001) are combined and slightly adapted:

'In a networked setting a Business Model is a representation of an Ecosystem of firms' underlying core logic and strategic choices for establishing inter-organizational architectures that create and capture value collaboratively and distribute this value among each other'.

2.1.2. Business Model Innovation

As discussed earlier (*see paragraph 1.1.2*), BMI refers to the renewal of the logic by which value is captured and created for the intended market segment(s) (Björkdahl et al., 2013). Whereas firms often invest heavily in the development of new technologies, their attention to BMI often falls short (Chesbrough, 2010). This is relevant because Smart Living technologies commercialized using two different BMs yield different outcomes. As argued by Perkmann & Spicer (2010), '*value is not intrinsic in technologies but has to be realized via suitable and viable configurations of organizational structures and relationships with external actors*' (p. 9). This statement is aligned with Chesbrough's following statement (Chesbrough, 2010): *'A mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model'* (p. 354).

What follows from these statements is that the value captured from a new technology is highly dependent on the BM with which this technology is offered to the market. This substantiates the need for BMI along with the launch of renewed service offerings and is why the BM behind a Smart Living service offering as constituted by an Ecosystem of actors is the unit of analysis of this research. BMI, however, is often hard to realize for firms because the operational processes that lie at the basis of the BM need to change as well, and the repository of tools that cover these processes is limited (Chesbrough, 2010). When it comes to an Ecosystem of partners, Solaimani (2014) distinguishes three categories of these underlying operational processes: value exchanges, information exchanges and business process alignment between Ecosystem actors. Davenport (1993) defines business processes as an arrangement of activities over place and time, which have a beginning, an end, inputs, and outputs. Business processes have measurable metrics, such as: customer satisfaction, output quality, time, and costs. A later paragraph (*see paragraph 2.1.4*) introduces the VIP framework, which reveals the alignment, misalignments, and conflicts in underlying operational processes of a BM. This framework is an extension of the *Organization* domain of the Service, Technology, Organization, and Finance (STOF) ontology, with which a networked BM can be formulated. This ontology, and other ontologies, are introduced in the next paragraph (*see paragraph 2.1.3*).

2.1.3. Business Model Ontologies

Next, the BM Canvas, e^3-value, Value Network Analysis (VNA), and STOF ontologies are discussed.

Business Model Canvas ontology

The BM Canvas (Osterwalder et al., 2002) is intended for the formulation of an existing or new BM. It can be applied as a software-based tool which, as argued by the authors, is valuable to managers

because visualization, design, and comparison of BMs are done quickly and more complex tasks such as simulation can be performed. This allows for a BM that is adaptive and swift in responding to the dynamics of a business environment. However, the BM Canvas focuses on individual firms and is thus less usable for a networked approach as presented in this research.

e^3-value ontology

The e^3-value ontology (Gordijn & Akkermans, 2001) takes a networked approach. It is a modeling approach designed to illustrate how economic value is generated within an Ecosystem. As argued by the authors, the advantage of this approach over conventional BM ontologies is that key characteristics of the BM are better communicated and, as a result, comprehended more thoroughly. The ontology is intended to make the value for all actors in the Ecosystem explicit. This is relevant because, as is argued in the next paragraph (*see paragraph 2.2.4*), the value capture within a Smart Living Ecosystem may be hard for individual actors because they originate from different industry sectors and often have different and conflicting strategic interests (Faber & Bouwman, 2004). However, the ontology primarily focuses on financial and economic processes related to BM components but does not cover key BM features, such as customer relationships and distribution channels.

Value Network Analysis

The Value Network Analysis (VNA) (Allee, 2008) captures how value is created and exchanged in an Ecosystem. Whereas the e^3-value ontology merely focuses on explicit financial and economic value exchanges, VNA attempts to make the value of both tangible and intangible assets explicit. It does so by assessing these assets in both financial and non-financial scorecards. It however fails at making the links of business processes among actors in the Ecosystem explicit.

STOF ontology

The STOF ontology (Bouwman et al., 2008) (*see Figure 4*) is usable for the formulation of a networked BM. It is specifically useful for networked enterprises that make IT-enabled service offerings (Bouwman et al., 2014). The authors argue that customer value should always be the starting point of a BM. For that reason, the starting point of the STOF ontology is the definition of the value proposition, as well as the value reaped from the service offered by service providers; i.e. Ecosystem partners in the context of this research.

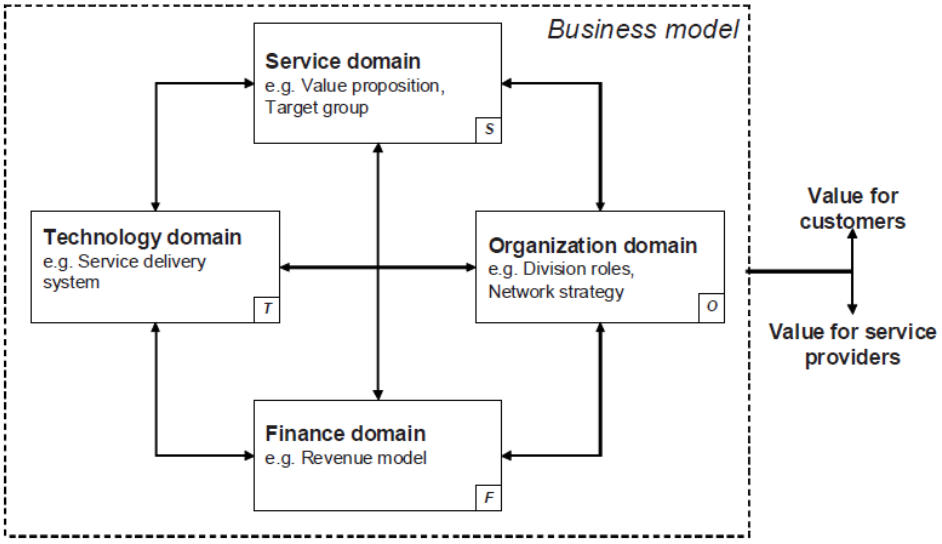

Figure 4 – Four domains of the STOF ontology. Source: Bouwman et al. (2008).

As illustrated in the figure, this model has four components at its core. The *Service* domain describes the added value of the offering for the intended market segments (Solaimani et al., 2015b). This domain specifies which customer segments are or should be targeted, how value for these segments is created, and how customer relationships are formed (Heikkilä et al., 2015). The concept of value is central to the Service domain (Faber & Bouwman, 2004). *Value* is interpreted as the costs and benefits of a product or service perceived by customer segments (Chen and Dubinsky, 2003). This value results from non-technical aspects, such as the value proposition, service delivery, channels of distribution, and aftersales (Solaimani et al., 2015b).

The *Technology* domain describes the technical functionality and architecture required to realize the service offering. The *technical functionality* is defined as the features of a system or application to serve its users (Faber & Bouwman, 2004). The *technical architecture* is constituted by the configuration of a technical system used to deliver the service offering to the intended market segments. A technological architecture consists of the infrastructure, platforms, networks, devices, and applications. Issues such as openness and interoperability of the features of the technological architecture are key during its configuration.

The *Organization* domain describes the actors' positions in the Ecosystem and the architecture of this network to build, govern, and supply the service offering. Required resources and capabilities are core here (Bouwman et al., 2008). With this domain, the starting point is that all these resources and capabilities often cannot be owned by one individual entity. This is in line with the contemporary rise of Ecosystems, as argued in the previous paragraph. Actors in the Ecosystem fulfill different roles, e.g. keystone player or niche player roles, and thereby complement their resources and capabilities to deliver the service offering collaboratively.

The *Finance* domain describes the financial arrangements between the Ecosystem actors (Bouwman et al., 2008). Included in the Finance domain are the means by which the Ecosystem partners pursue to collect revenues from the offering and how these financial resources are divided among each other. Management of investments, revenues, costs, prices, and risks are key here.

This research uses the STOF ontology as a basis for the formulation of a Smart Living BM. This is because, when applying the STOF ontology, a networked BM can be developed that is primarily intended to generate *value* for consumers and service providers. As this research concentrates on Ecosystems, it concentrates precisely on that: value for both service providers and consumers. Because of this, the *Organization* domain of the STOF ontology is concentrated on. Since the VIP framework is an extension of this Organization component, it is introduced in the next paragraph.

2.1.4. VIP Framework

As argued at the beginning of this paragraph, firms increasingly engage in the development of network-based innovations. Because of this growing degree of networkedness, ties between firms are growing stronger, leading to the emergence of networked BMs (Lindgren et al., 2010). As argued earlier (*see paragraph 2.1.1*), a challenge during the establishment of a networked BM is the complementation of competencies and the alignment of partners' success criteria. In line with this, Solaimani et al. (2015a) argue that the operational feasibility of BMs should be given adequate attention with Smart Living concepts. The VIP framework is an extension of the *Organization* domain of the STOF ontology that aims to deal with these challenges.

VIP framework

While the STOF ontology describes the networked BM in terms of *what* the Ecosystem partners should do to capture and deliver value, the VIP framework defines *how* this should be done

(Walenkamp et al., 2012). The framework is relevant for this research as it explicitly delves into challenges that emerge within an Ecosystem. It does so by revealing alignment, misalignments, and conflicts in actor interdependencies and interactions, and by presenting how to cope with the misalignments and conflicts (Solaimani & Bouwman, 2012a). The framework proposes that a formulation of a networked BM requires actors to have alignment and exchange of *value* within the Ecosystem, effective and continuous exchange of *information* within the Ecosystem, and interweaving of *business processes* of Ecosystem actors (Solaimani & Bouwman, 2012a). This is relevant because, often, insufficient attention is given to (i) the alignment of a (networked) BM and underlying processes and activities of Ecosystem actors, which is defined as Business Model Alignment (BMA) (Solaimani et al., 2015a), and (ii) the alignment of business processes *between* actors (Solaimani et al., 2010). This is because individual partners' operational processes are prone to incoherence and conflict (Solaimani & Bouwman, 2012a). Three factors have an impact on BMA (Solaimani et al., 2015a):

- *Co-dependency*: dependencies stimulate or even force Ecosystem actors to cooperate at the levels of value, information, and processes.
- *Complexity*: interactions regarding VIP components can be uncertain, complicated or vaguely determined.
- *Conflicts*: interactions, based on all three VIP components, can be irreconcilable or inconsistent with other interactions.

Evaluation and improvement of these three factors is essential for the realization of BMA (Solaimani et al., 2015a). The reason for this is that, as is argued later (*see paragraph 2.2.4*), an uneven distribution of costs or benefits among Ecosystem partners reinforces the probability of a failed initiative to capture value from a new service offering. As visualized in the figure below (*see Figure 5*), the VIP components on the vertical axis are applicable to four generic domains of collaborations between firms: (i) overview of the business network, (ii) resources and capabilities in the network, (iii) interactions between Ecosystem actors, and (iv) ties and interdependencies between Ecosystem actors (Solaimani et al., 2017).

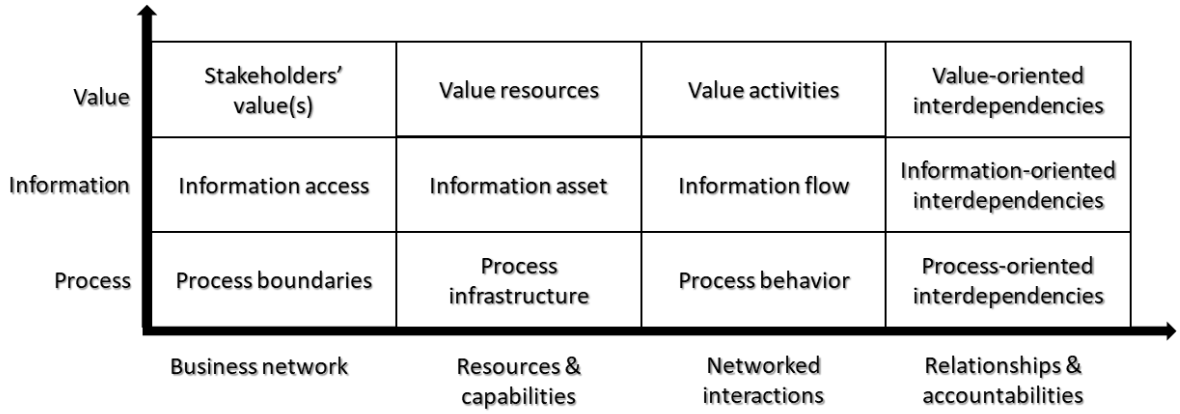

Figure 5 – The four domains of the VIP framework. Adapted from: Solaimani et al. (2017). Original source: Solaimani & Bouwman (2012a).

The VIP-related interdependencies and interactions between actors are visualized in a *VIP interactions and interdependencies diagram* (*see Figure 6*) (Solaimani, 2014). These interactions and interdependencies are thus categorized into three types of exchanges: value (green line), information (blue line), and processes (red line). Such a diagram does however not visualize alignment, misalignments, and conflicts between Ecosystem actors. Visualizing this is, amongst others, what the SD approach (*see paragraph 2.3*) can be used for.

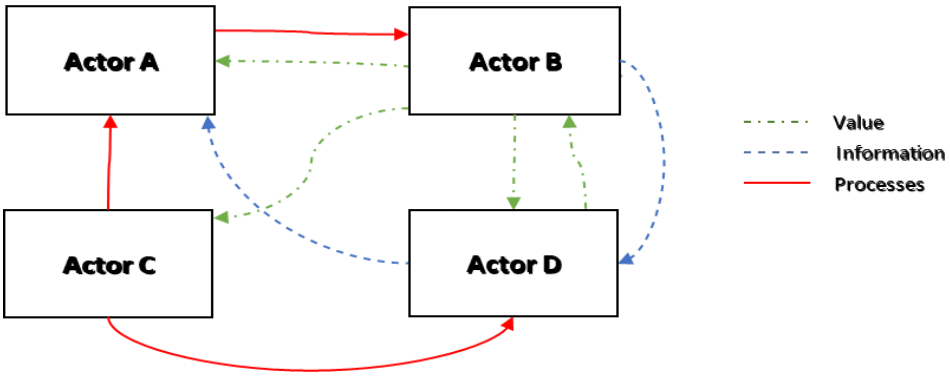

Figure 6 – VIP interactions and interdependencies diagram. Adapted from: Solaimani (2014).

Activity systems versus the VIP Framework

As explained earlier (*see paragraph 2.1.2*) BMI is hard to realize because operational processes need to change as well, and only a limited number of tools deal with this (Chesbrough, 2010). Zott & Amit (2010) argue that tooling is needed with which firms can design their future BM and with which they can evaluate and improve the BM designs to make them more suitable for the future. They present activity systems – architectures of interdependent activities that Ecosystem partners perform to pursue their common objective – as an enabler for Ecosystem partners to create value and to distribute this value among each other. A salient observation regarding the VIP framework is that it captures the definition of activity systems and reconciles these value resources[1] with *business processes*. As argued by Solaimani & Bouwman (2012), the inclusion of these business process interactions is of vital importance when attempting to comprehend actor relations, and the implementation of a BM is either enabled or blocked by business processes (Solaimani, 2014). On top of that, research within the telecom industry has demonstrated that alignment of operational processes, i.e. value exchanges, information exchanges, *and* business processes, promotes collaboration among Ecosystem partners and is a necessity for continued BM viability and feasibility (Bouwman et al., 2008). This provides yet another reason why the alignment of business processes should not be neglected.

Furthermore, whereas Zott & Amit (2010) argue that the description of activity systems gives a comprehensive overview of the essence of a BM (i.e. activity systems merely *reflect* the underlying BM), the VIP framework is specifically designed to identify conflicts (i) between actors' operational processes and (ii) between the operational processes and the networked BM (Solaimani & Bouwman, 2012a). When applying the VIP framework, the BM is therefore subject to inherent evaluation and thus ensures a *more robust* BM. As BM robustness is the dependent variable of the research, the VIP framework is considered more suitable than activity systems to evaluate and improve a BM design. Conclusive, combining the STOF ontology with the VIP framework provides a set of tools that help firms formulate a (networked) BM and understand the complexity of Ecosystem actors' underlying business processes and interdependencies of value and information flows between actors (Solaimani et al., 2015a).

2.2. Ecosystems as a subset of Business Models

Theory on Ecosystems as a subset of BMs is discussed in this paragraph. First, Ecosystems are defined (*see paragraph 2.2.1*). Second, the evolutionary cycles (*see paragraph 2.2.2*) and types of players

[1] The *information* component is considered a specific type of value resource that is deliberately detached from the *value* component because this reduces complexity and because information exchange is omnipresent in Ecosystems (Solaimani, 2014).

within it are elaborated on (*see paragraph 2.2.3*). Finally, the requirements for a healthy Ecosystem are outlined (*see paragraph 2.2.4*).

2.2.1. Defining Ecosystems

Moore (1996) argues that, analogous to how a biological Ecosystem represents organisms interacting with each other and their environment, a Business Ecosystem represents the environment in which entities, such as firms, governmental organizations, and customers, interact. Moore (2006) defines a Business Ecosystem as *'a collaboration to create a system of complementary capabilities and companies'* (p. 53). De Reuver et al. (2008) define a Value Network as *'a dynamic network of legally independent, collaborating actors who intend to generate customer value and network value by means of a specific service offering, and in which tangible and intangible value exchanges take place between the actors involved'* (p. 135). Peltoniemi (2004) recognizes that both terms have the same underlying features. Since these definitions of a Business Ecosystem and Value Network are contiguous but the second is more inclusive, the second definition is adhered to in this thesis report. The general term *Ecosystem* is used to describe a *Business Ecosystem* or *Value Network*.

Ecosystem Entities

The transformation from a core business to an Ecosystem perspective leads to the blurring of firm and industry sector boundaries (Moore, 1996). This increased porosity between firms and industries is effectuated by Ecosystem-leading firms that do not adhere to conventional industrial paradigms but reformulate models of industry and business. The illustration below (*see Figure 7*) visualizes how an individual firm's perspective can be expanded to an Ecosystem perspective and provides an initial overall picture of the actors and stakeholders involved in an Ecosystem. The figure however conflicts with *Figure 1* (*see paragraph 1.1.2*). In that figure, the continuous consumer validation of the service offering during the BM and Ecosystem formation is key. In that regard, customers become co-shapers of the BM and Ecosystem. This implies that direct customers should be part of the core business; the inner circle in the figure below. For that reason, the figure includes an arrow between *direct customers* and the *core business* tier.

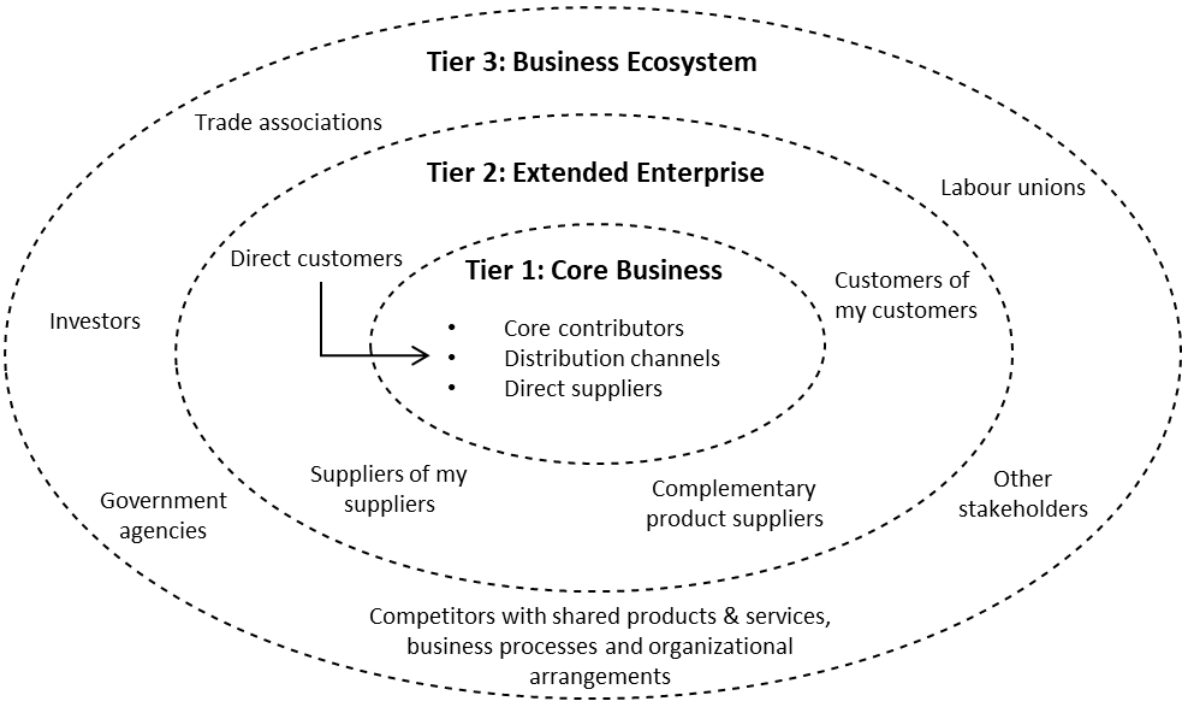

Figure 7 – From an individual firm to an Ecosystem perspective. Adapted from: Moore (1996).

Actors and roles

In Ecosystems, a distinction is made between *actors* and *roles*. Within this thesis report, the definition of Gordijn & Akkermans (2001) for an actor is slightly adapted. An *actor* is defined as an independent entity that delivers part of the service offering and attempts to profit or enhance its utility within its Ecosystem. The terms *actors* and *partners* are used interchangeably in this thesis report. *Actors* fulfill one or multiple Ecosystem *roles*. Specific examples of roles in the Smart Living sector are caretakers, service suppliers, product suppliers, and insurance companies (Bierhoff et al., 2007). Other actors that may potentially play a role in the Smart Living sector are introduced in the next chapter (*see paragraph 3.2*). The following paragraph discusses the evolutionary stages of Ecosystems and what challenges arise in each stage. Ecosystem actors should be aware of these challenges and the dynamics present.

2.2.2. Evolutionary cycles of Ecosystems

Just like products and services, Ecosystems have different life cycles. Moore (1996) introduces four stages of business Ecosystem development. Below, these four stages are explained, and the collaborative and competitive challenges to which the Ecosystem actors are subject in each stage are summarized in the table below (*see Table 1*). Since Smart Living Ecosystems are still in a pioneering stage, this stage warrants attention in this research. It should be noted that these stages and corresponding challenges are observed from the perspective of an Ecosystem leader rather than the Ecosystem in general. As the unit of analysis of this research is the BM of a service offering as constituted by an Ecosystem of actors, the challenges that occur during the pioneering stage are relevant for a telecom operator that intends to shape or reshape an Ecosystem.

Pioneering

In this stage the Ecosystem architecture is established. A proof of concept should be established that is more viable than the status quo. This requires the Ecosystem leader to evaluate how their resources can be integrated with that of potential partners and to clearly identify the value for the customer. Customers will acknowledge that the new service offering is subject to flaws. Therefore, close interaction between the customer and service providers is a requirement to learn. Corresponding to *Figure 1* (*see paragraph 1.1.2*), it is thus essential to consider direct customers as part of the core business in the pioneering stage, because they add value to the service offering by providing feedback on its quality.

Expansion

In the expansion stage, the scope can be broadened as the proof of concept and profitability have been realized. The Ecosystem leader should establish and improve key relationships with partners and customer segments, while also investing in efforts to increase their scope and scale. If the scope and scale are not expanded, the leader is unlikely to survive.

Authority

As the Ecosystem matures and competition for both profits and leadership becomes fiercer, leaders should have centralized themselves in the customer segments they serve. Leaders should maintain and defend their authority in the Ecosystem and formulate a convincing future vision.

Renewal

In the renewal stage, Ecosystem leaders need to innovate and renew their service offering to survive. If they do not, their continued existence is not guaranteed. In this stage, new competing initiatives can rapidly challenge and overthrow the incumbent Ecosystem.

Table 1 – Challenges for an Ecosystem leader during the Ecosystem development. Adapted from: Moore (1996).

	Challenges for collaboration	Challenges for competition
Pioneering	Collaborate with customers and suppliers to formulate a value proposition for the innovative concept	Shield the initiative from others that may be working on similar concepts. Set up channels and connect with essential consumers and suppliers
Expansion	Launch the initiative on the market, scale up supply by working together with Ecosystem partners, and attempt to maximize market coverage	Push the initiative to become the standard in target markets and attempt to overthrow competing initiatives
Authority	Establish a convincing future vision that incentivizes Ecosystem partners to collaborate with each other and consumers to improve the concept	Protect the bargaining power in relation to other Ecosystem stakeholders
Renewal	Collaborate with innovators to renew the existing Ecosystem by introducing new ideas	Establish high entry barriers to prevent the formation of new Ecosystems that may compete with the service offering. Also, retain high cost of switching for customers to win extra time for the generation of new ideas for Ecosystem renewal

2.2.3. Types of players

Apart from the challenges described in the previous paragraph, other challenges emerge during the formation of Ecosystems. These requirements for a healthy Ecosystem are described in the next paragraph. First, the different types of players in an Ecosystem – dominators, keystone players, niche players, and complementors (Basole, 2009) – are explained. This is relevant because the type of player that an Ecosystem actor pursues to be impacts the willingness from other actors to cooperate. The potential *roles* that actors in a Smart Living Ecosystem will fulfill, and what *types of players* they will become, is explained in the next chapter (*see paragraph 3.2*). *Dominators* often play a leading role in an Ecosystem and strive to generate and capture value for their own benefit while leaving little for partners. Firms adopting a dominator role are often tempted to capitalize on their position by pursuing short term profits. In an emerging domain, such as that of Smart Living, such an attitude may inhibit innovativeness and fruitfulness of partnerships. *Keystone players*, on the other hand, have a different objective. Keystone players take leadership in steering the Ecosystem and attempt to improve its state. They often take a central role in an Ecosystem and have a high degree of connectedness. Finally, most partners within an Ecosystem can be categorized as *niche players*. These non-dominant actors have specific competencies with which they differentiate themselves to gain a position in the Ecosystem. Their position and growth depend on their ability to maintain their level of differentiation. *Complementors* form a specific subset of actors categorized as niche players. These are third party actors that directly offer their services or products complement the core product or service offered; increasing its perceived value by its customers (Brandenburger & Nalebuff, 1997). An example of a complementor in a Smart Living Ecosystem is an actor that offers its application software on a platform administered by a keystone player (Nikayin, 2014). The next paragraph discusses how these players, specifically dominators, affect the overall health of the Ecosystem.

2.2.4. Requirements for an Ecosystem

This paragraph describes what requirements academic literature provides for a healthy Ecosystem. This knowledge can be used as an input for the process of drafting a networked (Smart Living) BM. The starting point is that Ecosystems can be analyzed based on three indicators for describing an inter-organizational structure (Santana Tapia, 2006). Ecosystem partners should have (i) a common

purpose, (ii) a high degree of interaction and (iii) long-term relationships. Creating value for customers may be hard as defining user requirements proves to be a complex task, and design requirements often clash with each other (Faber & Bouwman, 2004). Capturing value may also be hard for individual Ecosystem actors because they often originate from different industry sectors and have different, often conflicting strategic interests. Moore demonstrates that networked firms' success is highly dependent on the establishment and continuity of constructive relationships which are valuable to all partners in the Ecosystem (Moore, 1996). This reasoning corresponds with that of Solaimani et al. (2010), who state that Smart Living initiatives only have success potential when partners in the Ecosystem adopt a collaborative mindset and are focused on the generation and transfer of value.

A healthy Ecosystem is constituted by partners that collaborate to evolve and realize their shared vision (Moore, 2006). A prerequisite for this is a democratic decision-making process. This democratic characteristic is of relevance when relating it to the concept of dominators. When a firm acts as a dominator, it attempts to appropriate as much value as possible from the service(s) offered. In fact, often all actors in an Ecosystem compete to appropriate as much as possible value (Brandenburger & Nalebuff, 1997). As argued by de Reuver et al. (2009) this may cause conflicts regarding the distribution of investment costs and revenues between the partners, but also with regard to their roles and responsibilities. Account should be taken of this during the development of a (Smart Living) BM. Notably, a too dominant position of one firm may inhibit democratic decision-making which in turn could deter other Ecosystem actors. In a healthy Ecosystem, leaders should provide stimulus for the collaborations between other Ecosystem actors (Moore, 2006). When striving to become dominators, their fight to adopt this dominating position in the Ecosystem could discourage other actors to cooperate and seek a position in the Ecosystem (Nikayin & De Reuver, 2015).

2.3. Partner selection and role definition

In line with the previous paragraph on Ecosystems, this paragraph delves into the process of constituting the Ecosystem. As previously discussed, this happens in parallel with the formulation of the BM. During this process, the requirements for a healthy Ecosystem (*see paragraph 2.2.4*) should be considered. In short, it thus needs to be ensured that potential Ecosystem partners have a common purpose, a high degree of interaction and long-term relationships. Every actor should contribute to the shared vision in a democratic process, no actor should act as a dominator, and all should comprehend that striving for a dominant position inhibits fruitfulness of partnerships. The Partner Value Matrix (*see Table 2*) is a tool with which the mutual benefits of new partnerships for each actor involved can be defined (Haaker et al., 2018). It explicates the value of partnering up for each individual actor and delineates what each actor contributes to the partnership. The process of setting up a Partner Value Matrix consists of three steps (Haaker et al., 2018):

i. Partner selection. The first step is to define the potential partners that could contribute to the service offering. These are listed in the left column in the matrix.

ii. What do the partners bring? In this step, it is defined how each partner contributes to the service offering. This can be in terms of resources, sales channels, funds, or other contributions. Examples of resources are hardware, knowledge, or complementary services for the Smart Living offering. Examples of other contributions are: advice, service, and support.

iii. What is in it for the partners? Partners should also gain value from the collaboration. For instance, an actor can benefit from new sales channels that are facilitated by another actor.

Table 2 – Partner Value Matrix. Adapted from: Haaker et al. (2018).

Partners	What do they bring?				What is in it for them?			
	Resources	Sales	€	Other	Resources	Sales	€	Other
Actor 1								
Actor 2								
Actor 3								
Actor 4								

As mentioned at the beginning of this chapter, the Partner Value Matrix has its limitations. Although it visualizes the value of the partnership for the actors, it does not go into details about how to select Ecosystem partners. Also, the tool does not explicitly define the required primary roles in the Ecosystem. These roles are discussed in a later paragraph (*see paragraph 3.2.1*). Primary roles are roles that are specific to the service offering and are required for a well-functioning Ecosystem. A *service scenario* constitutes these roles for a specific service, the actors that fulfill these roles, and the relationship of these actors to each other. The service scenario has a corresponding BM, of which the robustness should be evaluated before introducing the service offering to the market. For this purpose, an SD approach may prove useful. This is what the following paragraph delves into. When looking back at the process framework that was introduced at the beginning of this chapter (*see Figure 2*), the above explanation again proves that the BM formulation (stage 1a), partner selection and role division (stage 1b) and evaluation of BM robustness and partner alignment (stage 2) stages are highly intertwined.

2.4. Business Model evaluation and partner alignment

The previous paragraphs provided ontologies and tooling to formulate a BM, select partners, and divide roles. From the process framework (*see Figure 2*), it follows that the next stage is to introduce tooling with which the robustness of the BM can be evaluated and improved. BM evaluation is the process of systematically analyzing a BM's robustness (Bouwman et al., 2017). As stated in the first chapter (*see paragraph 1.2*) BM robustness is selected as dependent variable of this research. The reason for this is that BM robustness is considered a prerequisite for the effectiveness of a BM (Bouwman et al., 2008). BM evaluation is therefore key in this paragraph. First, BM robustness is further elaborated on (*see paragraph 2.4.1*). Finally, SD is introduced as an approach to enhance BM robustness and to explore the STOF ontology and VIP framework in more detail (*see paragraph 2.4.2*).

2.4.1. Business Model robustness

Abdelkafi & Täuscher (2015) define a robust BM as a BM that can maintain continued effectiveness over time. In contrast, Bouwman et al. (2017) define BM robustness as a BM that is both viable and feasible on the long term. The second definition is adopted in this thesis report because it consists of two clearly defined and measurable criteria. BM feasibility describes how well a BM can function in a prospective environment. BM viability describes how financially sustainable a BM is. As this review takes a networked approach, this definition is expanded to financial sustainability, both for the Ecosystem as a whole and for the individual actors in it. In the next paragraph, SD is introduced as an approach with which BM robustness can be evaluated.

2.4.2. System Dynamics

SD is a modeling and simulation approach that can be used to evaluate the dynamics of a complex system such as a BM (Cosenz & Noto, 2016). The starting point of SD is that complex systems can be described using elements and flows (Duran-Encalada & Paucar-Caceres, 2012). Flows represent the relationships between the elements. With SD, the patterns of these flows and elements, i.e. parameters, are visualized. SD attempts to make a prediction of the system's behavior by visualizing negative (-) or positive (+) relationships between parameters within this system. Dynamics of the system are also visualized by means of feedback loops – loops that follow the causality chain which eventually re-affect the initial parameter. These feedback loops are either reinforcing or balancing, i.e. they either reinforce or balance the initial parameter (*see Figure 8*).

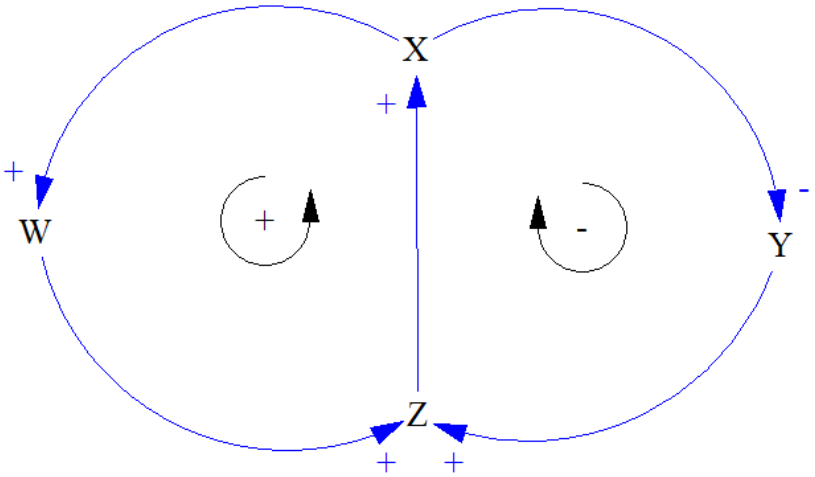

Figure 8 – Reinforcing (left) and balancing feedback loops (right).

An SD approach is useful to evaluate BM robustness, both *before* and *after* the implementation of the BM. Research points out that humans are likely to misinterpret how systems with dynamic relations behave (Simon, 1957). BMs are based on assumptions about cause-and-effect relationships and feedback loops between variables (Abdelkafi & Täuscher, 2015). SD helps overcome bounded rationality by visualizing these causal structures. Comprehending the structure of a complex system enables researchers and managers to make predictions of dynamic behavior. This is because the system's behavior can be derived from its structure (Sterman, 2002). The result of this is a better managerial understanding of causal relationships between acquisition and depletion of resources. This improved understanding allows managers to make better-informed decisions and allows for continuous enhancement of the BM's robustness (Abdelkafi & Täuscher, 2015).

When considering the use of SD *after* the implementation of the BM, quantification is required. SD can then be used to create a 'living' BM, which can be continually updated and controlled (Abdelkafi & Täuscher, 2015). It enables managers to enter the actual data alongside the simulation, which allows for continuous monitoring of performance. If performance does not meet the simulated outcomes, the equations behind the simulation can be adapted relatively easily. In line with the process framework introduced at the beginning of this chapter (*see Figure 2*), in this research the focus is on BM robustness evaluation *before* the implementation of the BM. How to evaluate this robustness is explained later in this paragraph. First, it is explained how the VIP framework can be integrated with an SD approach.

Building upon the STOF ontology and VIP framework

Ecosystem are central in this research, and their creation and appropriation of value from the service offering are essential. Tian et al. (2008) state that an essential part of modeling and analyzing Ecosystems is to comprehend the dynamics of the interactions that actors in this Ecosystem have. For the evaluation of BM robustness, an SD approach can be used to zoom in on the *Organization* domain of the STOF ontology and visualize key relationships among actors in terms of the three VIP components. These VIP components reflect the extent to which the value and information exchanges among actors in the Ecosystem are aligned, and the extent to which business processes of these actors are interwoven. With an SD approach, the dynamics of these interactions become clear. A graphical demonstration of the exchange of these components between the Ecosystem actors can be used to draw conclusions about the coherence and sustainability of the Ecosystem structure from the perspective of the actors themselves. Reflecting on this coherence and sustainability allows for decision-making that improves partner alignment.

Defining core BM metrics

Heikkilä et al. (2015) present four arguments as to why BM metrics should be considered during the BM design. First, this is due to the relation between strategy and measures. As discussed earlier (*see paragraph 2.1.1*) the BM is the translation of a Business Strategy. Metrics can be useful to maintain the alignment between strategy and BM during the development of the BM. Second, the use of metrics helps identify potential causalities between the strategy, BM, and implementation. The simultaneous development of BM and metrics enhances the cognitive ability of managers to understand the dynamics in the business environment. By gaining a better understanding of these dynamics, managers also gain a better insight into the consequences of their actions. This allows for more adequate decision-making and enhanced agility when implementing the BM. This reasoning is consistent with the reasoning of Abdelkafi & Täuscher (2015) about why SD can be useful, as outlined in the first section of this paragraph. Third, when using metrics, requirements can be established to reach the desired performance. The metrics can provide insight into which metric values are realistic and which are not. Based on this, the balance between different strategic objectives can be reconsidered. Finally, metrics make it evaluable whether the right, valid, and reliable data is used.

Recent research concludes that there is value in qualitatively modeling the structure of a BM without running simulations, as this allows for the conveyance of the structure of this system and associated cause-and-effect relationships (Scott et al., 2014). Therefore, and because of limited availability of quantitative data, this research uses qualitative modeling but no quantitative computer simulation to analyze the alignment, misalignments, and conflicts in Ecosystem partners' relationships and the corresponding BM robustness. As the research concentrates on Ecosystems, the cause-and-effect relationships of the dynamic interactions between Ecosystem partners can be visualized using VIP metrics. The BM metric repository, as introduced by Heikkilä et al. (2015), can be drawn from when exploring metrics to display these interactions. Examples of VIP- and STOF-related metrics are presented in the below table (*see Table 3*).

Table 3 – Perspectives and examples of BM variables. Source: Heikkilä et al. (2015).

Perspective	Examples of metrics
Customer Value	Media attraction, range of customer relations, number of hits on corporate website
Service	Required time to develop service offering, performance of service offerings, number of complaints from customers, customer loyalty
Technology	Required time to implement soft- and hardware, extent of data integration, co-operation between systems, security of data
Organization	Number of (skilled) workers, access to corporate network, number of network partners, size of network

Finance	Value created for providers in the Ecosystem, profit margin, costs of development, indicators of risk
Value exchange	Number of partners in Ecosystem, exchange of value between partners, value of transactions, partner commitment
Information exchange	Number of partners in Ecosystem, exchange of information between partners, number of shared information systems, advancement of knowledge level
Business Process alignment	Exchange of resources and competencies, duration of processes, standardization of processes

The use of these metrics helps to focus on the desired strategic results and to define the required performance levels of the BM. What should be noted is that BM metrics are regularly adapted in the process of developing the BM (Heikkilä et al., 2015). As observed by Bouwman et al. (2006), BMs are not set in stone but develop as markets or regulations change or as new technologies are introduced. This applies specifically to the dynamic environment of networked organizations that offer a service collaboratively. It is therefore essential to note the fact that, as the BM evolves, its core metrics should remain adaptable.

Analyzing and improving Business Model robustness

Four criteria can be used to analyze the robustness of a BM that is established using an SD approach (Abdelkafi & Täuscher, 2015). Based on these criteria, four strategies are formulated to enhance BM robustness (*see Table 4*). The four criteria based on which BM robustness can be analyzed are as follows: (i) uncertainty about key system parameters, (ii) tolerance to unpredicted dynamics in system parameters, (iii) feedback about the BM's effectiveness, and (iv) and adaptability of the BM structure. These four criteria and corresponding strategies are discussed in detail below. They are however set up for an individual firm's BM rather than a networked BM. For that reason, it is evaluated if they are usable to enhance the robustness of a networked BM as well. It should also be noted that this literature relates to an SD-based BM in general and not specifically to the VIP framework. It however is relevant for this research because the VIP framework is an extension of the *Organization* domain of the STOF ontology; i.e. it is closely associated with the BM. Finally, it should be noted that the evaluation of the networked BM's robustness may lead to decisions that re-shape the BM. Referring to the framework introduced at the beginning of this chapter, this emphasizes that the BM formulation (stage 1a), the partner selection and role definition (stage 1b) and BM evaluation and partner alignment (stage 2) stages are considerably intertwined.

(i) First, a number of relevant and certain *key system parameters* must be chosen to build the BM upon. Parameters can be highly uncertain and hard to predict. In the context of this research, such uncertain parameters could be consumer value or market demand. Currently, there is only little reliable data about the market demand for Smart Living offerings. If a BM is entirely based on speculative assumptions about parameter levels, the robustness of the BM is only limited. For that reason, the highly uncertain parameters can be eliminated. Risk of uncertain parameters could, for instance, be outsourced to Ecosystem partners or consumers. In the context of this research, if the value of the service offering to consumers or market demand is too uncertain from the perspective of the telecom operator, it may choose to outsource the customer relationships to an Ecosystem partner and only administer the platform with which these services are offered. Naturally, this necessitates that this Ecosystem – and BM – structure is attractive for the Ecosystem partner as well. Although the above strategy could prove useful when enhancing the robustness of an actor's *individual* BM, when it comes to the *networked* BM this merely implies that risks of uncertain parameters are shifted between Ecosystem partners. Consequently, this strategy does not enhance the robustness of the *networked* BM as constituted by the Ecosystem partners and is therefore not usable in this research.

(ii) Second, the BM's *tolerance to unpredicted dynamics* in system parameters also impacts its robustness. A balancing feedback loop can be introduced to stabilize this tolerance. This can for instance be realized by introducing multiple sales channels. If market demand in one sales channel suddenly drops, this can be absorbed by shifting focus to another channel. Such strategies can be applied to enhance the robustness of both an *individual* and a *networked* BM.

(iii) Third, the BM can be assessed based on the feedback it provides regarding the validity of its underlying assumptions. Problematic system behavior can be identified by graphically indicating delays. For instance, there may be a significant delay between investments in market expansion and feedback that points out the effectiveness of these investments. In this case of feedback delay, it is not advisable to pursue an objective of rapid expansion. BMs always have implicit assumptions about cause-and-effect relationships (Casadesus-Masanell and Ricart, 2010). The quicker feedback is provided regarding false assumptions about these cause-and-effect relationships within the model, the quicker the BM can be adapted (Abdelkafi & Täuscher, 2015). This enhances the BM's robustness. An option is to let consumers assess if their expected quality of the service is met by running a trial version of the service offering before fully implementing the BM. This continuous consumer validation relates to *Figure 1* in the first chapter (*see paragraph 1.1.2*). The above strategy can be applied to enhance the robustness of both an *individual* and a *networked* BM.

(iv) Fourth, the structure of the model should remain adaptable. Path dependence follows from parameters that deplete or accumulate in a selected timeframe, such as value creation capacity or stocks of cash. This depletion or accumulation is not visualized by feedback loops and is therefore prone to insufficient attention. If, for instance, extensive investments are made in value creation capacity that is not fully exploited, this poses a problem that is not visualized in the SD model. A strategy to reduce path dependence is to make the BM more adaptive. In the context of this research, this could include contracts with hardware providers that produce hardware as part of the Smart Living service offering. If sales prove to be disappointing, the supply of hardware cannot be easily adjusted as this is included in the contract. A salient observation is that the above strategy enhances the robustness of a *networked* BM, but not necessarily that of an individual actor. From an individual actor' perspective, the other side of the spectrum is that it could also be *beneficial* to *establish* path dependence and make other Ecosystem actors dependent on their products and services. This could potentially enhance the robustness of their individual BM.

Table 4 – Criteria to analyze BM robustness, corresponding strategies to enhance BM robustness, and applicability for a networked BM. Adapted from: Abdelkafi & Täuscher (2015).

Criterion	Strategy to meet the criterion	Applicable for a networked BM?
Uncertainty about key system parameters	Stabilization of the system by the elimination of as much as possible parameters with high uncertainty	No; this would only lead to a shift of risks between Ecosystem partners
Tolerance to unpredicted dynamics in system parameters	Introduction of a balancing feedback loop to improve tolerance to unpredicted dynamics in system parameters	Yes; both for a single-firm and networked BM unpredicted dynamics in parameters can be counteracted by introducing a balancing feedback loop
Feedback about the BM's effectiveness	Reduction of delays in the BM's feedback loops	Yes; delays can be reduced both for a single-firm and networked BM
Adaptability of the BM structure	Enhancing BM adaptability	Yes; both single-firm and networked BMs can be made more adaptive to increase BM robustness

Business Model stress testing versus System Dynamics

A tool designed specifically for the evaluation of a BM's robustness is the BM stress test (Haaker et al., 2017). This tool aims to evaluate the BM by testing it against different market scenarios and uncertainties in regulations or technology. The objective of the tool is to establish a more robust and more agile BM that is responsive to market dynamics. It does so by making explicit in which scenarios the BM is both viable and feasible (i.e. robust), and in which scenarios it is not. SD, or computer simulation in general, can also evaluate the robustness of a BM by stress-testing it against multiple scenarios of potential external events (Abdelkafi & Täuscher, 2015). This is relevant because, according to Bouwman et al. (2008), a robust BM must be able to cope with changes in the business environment. Whereas BM stress testing is usually performed at one point in time and is mainly useful during the development phase(s) of a BM, SD provides continuous feedback regarding cause-and-effect relationships of scenarios, and the model can be adapted real-time. SD thus allows for an *adaptive* representation of the BM that is useful both before and after its implementation. For that reason, within this research an SD approach is used. It should however be noted that the full range of benefits of SD is only achieved when a quantitative approach is used, rather than the qualitative SD approach that is used in this research. This is elaborated on in the fifth chapter (*see paragraph 5.1.7*).

2.5. Business Model implementation

Now that tools have been discussed with which, from the perspective of the *Organization* domain of the STOF ontology, an operationally sustainable and robust networked BM can be formulated, guidelines for how to *implement* this BM are still missing. This paragraph presents the third stage of the process framework provided in the introduction of this chapter: BM implementation (*see Figure 2*). As described earlier (*see paragraph 1.2.2*) BM implementation is the formulation and application of activities or policies with the objective of effectuating the BM (Solaimani et al., 2015a). This research aims to formulate these activities and policies. The first paragraph introduces a tool for this objective: BM roadmapping (*see paragraph 2.5.1*). The second paragraph examines the challenges that emerge when applying the tool for an Ecosystem of actors (*see paragraph 2.5.2*).

2.5.1. Business Model roadmapping

BM roadmapping is a tool that visualizes the intermediate activities required to make the transition from an *as-is* to a *to-be* BM (de Reuver et al., 2013). Its objective is to sequence these activities. Officially, these activities are categorized within the four components of the STOF ontology. In the context of this research the activities emerge from VIP-related misalignments and conflicts (s*ee paragraph 2.4*). This tool may thus be useful to establish and sequence the activities required to solve VIP-related misalignments and conflicts, and thereby improve the robustness of the networked BM (*see Figure 9*). The BM roadmapping process exists of four steps (De Reuver et al., 2013):

i. Define required BM changes. This requires the description of the as-is and to-be BM of a service. The main contrasts between the as-is and the to-be BM should first be identified. Based on this, an overview is formed of the features, relating to the four STOF components, that will be adapted.

ii. Analyze the effect of these changes to other BM domains. The changes identified in step one lead to required changes to other STOF component features. These required changes are defined in the second phase of the roadmapping process.

iii. Convert these changes into activities. The required changes of BM features, as derived from the first two steps, should be translated into activities; i.e. the acquisition of new, or disposal of existing resources and skills. Apart from this, the impact of these activities on the

Ecosystem should be evaluated, because its architecture and the relationships between actors may have changed.

iv. Backcast the desired transition trajectory and visualize the activities in a roadmap. The roadmap should also visualize interactor relationships. While doing so, for each activity the impacts and the degree of reversibility should be evaluated. An example output of the roadmapping process is given in the figure below (*see Figure 9*).

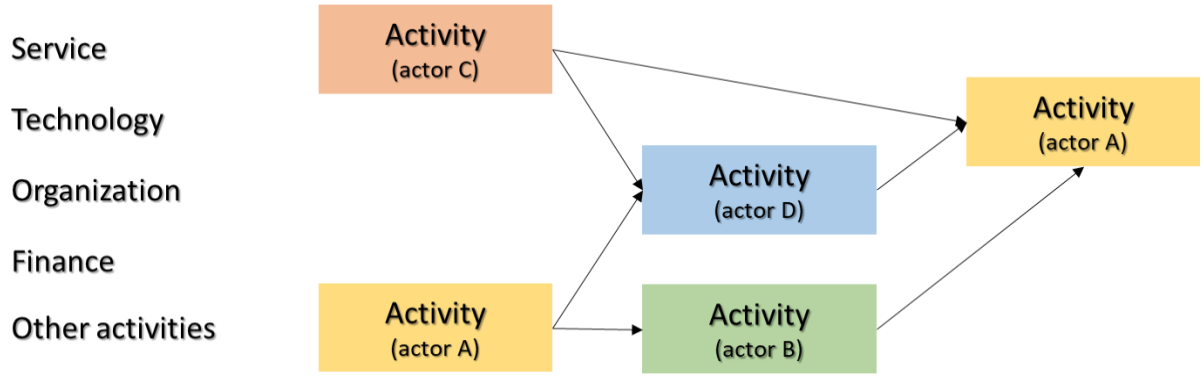

Figure 9 – Business Model roadmap for activities to resolve VIP-related misalignments or conflicts. Adapted from: De Reuver et al. (2013).

2.5.2. Obstacles for an Ecosystem

Roadmapping is applied both by individual firms and collaboratively by networks of firms (De Reuver et al., 2013). There are however various challenges for the implementation of BM roadmapping in a networked setting and literature provides few guidelines for this process. For a networked BM that an Ecosystem of actors intend to implement, it naturally becomes harder to agree on how to sequence the activities as compared to doing this for a single-firm BM. Also, as argued by Lindgren et al. (2010), a networked BM concept obliges individual actors to adjust their BM to the values that the Ecosystem actors share. Usually, this means that a dominant actor is required to make the fewest changes to its individual BM, whereas small actors may be expected to make more radical changes to their BMs. This imbalance may be prone to conflict, potentially impeding the transition to the to-be networked BM. This also clashes with the guideline for a democratic decision-making process, as explained in a previous paragraph (*see paragraph 2.2.4*). Groenveld (2007) also argues that BM roadmapping is a challenging process to apply for an Ecosystem of actors. Firms tend to misjudge the required time and effort to effectuate a roadmap and often assume that the roadmapping process has an abrupt end rather than being continuous. Also, roadmapping requires actors from various business units. Firms do often not realize that, as the roadmap develops, different business units may have different tasks. Finally, issues with trust, transparency, and collaboration between the different actors responsible for the development of the roadmap may emerge. This research focuses on making a roadmap for the activities to resolve interactor misalignments and conflicts. It thus helps make the transition from an as-is networked BM to a more robust to-be networked BM. What it does not do is define activities to make the transition from several firms' individual as-is BMs to one to-be networked BM. Nonetheless, the above obstacles should be taken into account during the application of the roadmapping process in this research.

2.6. Conclusion

This paragraph serves two purposes. It (i) elaborates on how the aforementioned ontology and tooling all fit together, and (ii) concludes this chapter. At the beginning of this chapter, a framework was proposed which serves as a guideline to establish a robust networked BM with which an

Ecosystem of actors can collaboratively provide a (Smart Living) service offering to targeted market segments. Now that usable BM tooling and ontologies have been introduced, the figure below visualizes how these can be linked to the different stages of the framework (*see Figure 10*). This is briefly explained below the figure.

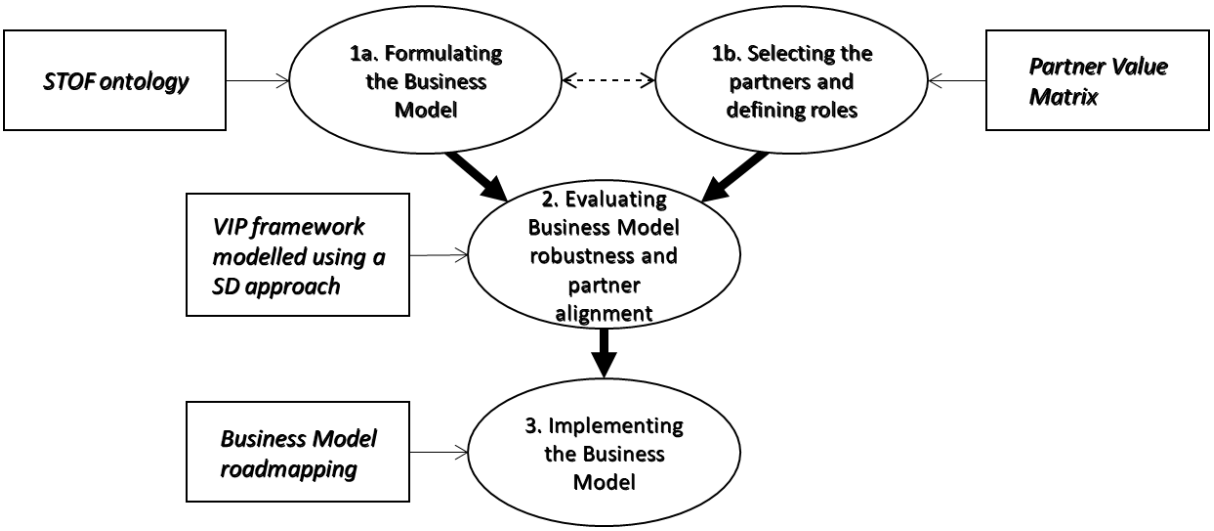

Figure 10 – Process framework.

The Partner Value Matrix is used to establish partnerships between actors. In parallel, the STOF ontology can be used to formulate the BM. As described, the focus of this BM is on the Ecosystem to be developed, which means that the *Organization* domain is concentrated on. As an extension of this domain, the VIP framework and an SD approach are integrated. This generates a dynamic model to analyze and improve Ecosystem partner alignment. Improving this alignment leads to an increased robustness of the underlying BM. The strategies to enhance BM robustness can be used to support the process of improving the robustness of this BM. Finally, Business Model roadmapping is applied to resolve these conflicts in a structured way by making a transition from the as-is to the to-be BM. While doing so, the obstacles for roadmapping in an Ecosystem setting must be considered. In the fourth chapter it becomes clear that this *process framework* can be used as a basis for the *research framework* (*see paragraph 4.5*).

3. | Research domain

This chapter describes the research domain: Smart Living. In the first paragraph, Smart Living is defined and conceptualized (*see paragraph 3.1*). Smart Living Ecosystems are outlined in the second paragraph (*see paragraph 3.2*). Finally, the chapter is concluded (*see paragraph 3.3*).

3.1. Smart Living

To give the reader an idea of what Smart Living encompasses, Smart Living is defined (*see paragraph 3.1.1*) and conceptualized (*see paragraph 3.1.2*). Also, the demand for Smart Living services in the Netherlands is touched upon (*see paragraph 3.1.3*).

3.1.1. Defining Smart Living

The term *Smart Living* has evolved from or is used interchangeably with the terms Domotica, Smart Home, Digital Home, and IoT (Solaimani et al., 2015b; Venkatesh, 2008). The Smart Living sector includes a wide range of technologies, including multimedia systems, sensors, energy appliances, lighting systems, and home robots (Venkatesh, 2008). In recent years, advancement in technologies has transformed the conventional notion of Smart Homes from simple home automation to radically innovative services (Nikayin & De Reuver, 2015). The contemporary general notion of Smart Living is that technologies start playing an essential role in home life (Venkatesh, 2008). In this thesis report, the term *home life* is defined as the structure of individuals' lives in relation to their residences. In the appendix, three impact categories are introduced, which allow the reader to conceptualize the impact on the home lives of residents that this wide range of technologies may have (*see appendix II*). According to Solaimani et al. (2015b), the term *Smart Home* implicitly suggests that its range of features remain *within* household residences. As these features nowadays extend beyond the inside of residences, thereby impacting the other domains of life of individuals, the term *Smart Living* is deemed more suitable and is therefore used throughout this thesis report. Defining Smart Living proves to be a difficult task, as different industry sectors have varying interpretations of the nature and functions of Smart Living technologies. A broad definition is as follows (Aldrich, 2006):

'A Smart Home can be defined as a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security and entertainment through the management of technology within the home and connections to the world beyond' (p. 17).'

3.1.2. Conceptualizing Smart Living

To embark on the conceptualization of Smart Living and its relation to residents' lives, first, the three requirements that need to be satisfied to make a home smart are introduced (Alam et al., 2012) (*see Figure 11*). These are: (i) an *internal network*, which should be either wireless or supported by cable or wire, (ii) *smart control* by a gateway that is present to control the systems and devices by connecting dissimilar networks, and (iii) *automation* of products and services within and outside the home.

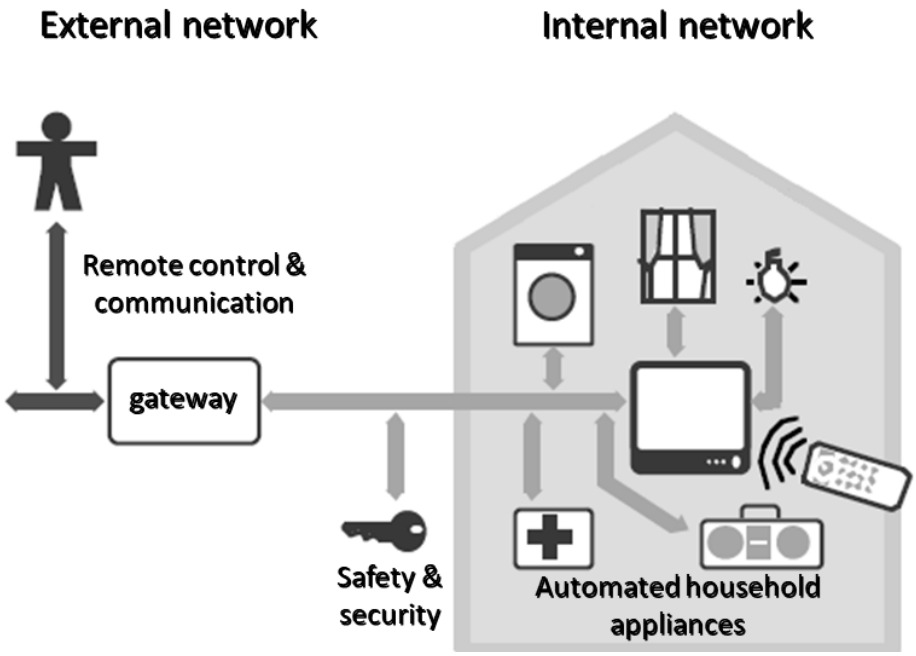

Figure 11 – Visualization of the Smart Living concept. Adapted from: Bierhoff et al., (2007).

These three requirements offer a range of features. Looking at these features, the broad concept of Smart Living can be divided into different domains. Nikayin & De Reuver (2015) specify five domains: energy, home automation, e-healthcare & independent living, entertainment services, and surveillance. What is notable is that, while the surveillance domain explicates the inherent goal of Smart Living products and services, the energy domain does not. Alam et al. (2012) specify five domains. They argue that Smart Living provides comfort, healthcare, security, safety, and energy conservation. As the specification of domains in terms of goals is considered more convenient when conceptualizing Smart Living, the domains of Alam et al. (2012) are used as a starting point in this thesis report. However, as is explained next, a few changes are made to these domains.

Safety represents the level of protection against random events (Albrechtsen, 2003). Within the Smart Living sector, an example of such a random event may be a power outage, leaving devices inoperative. Security, on the other hand, is explained by the protection degree against intended events. An example of such a deliberate action is the commission of a burglary. An intrusion alarm directly displayed on the residents' mobile phones can enhance security (Bierhoff et al., 2007). As the definitions of safety and security both represent the protection against incidents, these two separate Smart Living domains as presented by Alam et al. are merged to one domain: security & safety. Next, the energy conservation domain is considered too narrowly specified. Smart Living features provide individuals with the ability to control and manage their energy consumption proactively (Ren et al., 2011; Weiss et al., 2011) or even produce it independently (Solaimani et al., 2015b). For that reason, a broader definition – energy management – is adopted in this thesis report. Also, the domains presented by Alam et al. (2012) do not include the entertainment services that Nikayin & De Reuver (2015) do include. As the definition of entertainment is adjacent to that of comfort, a broader domain is specified: comfort & entertainment. Next, these four domains and their primary features are explained. This is summarized in the below figure (*see Figure 12*).

Comfort & entertainment

Within the comfort and entertainment domain, Smart Living is interpreted as the emergence of new IT-based offerings which aim to improve the connection between individuals and appliances and to set a pathway towards the implementation of teleworking solutions (Solaimani et al., 2015b). Individuals can remotely control devices, thereby performing tasks before arriving at their homes (Alam et al., 2012). Examples of these tasks are: remotely turning on the heating or oven, opening the doors, and switching on the lighting. Another feature within this domain is the identification of residents' activities by technologies. Continuous monitoring allows Smart Living systems to start recognizing patterns in behavior of residents, identify them, and tweak and automate tasks based on these inputs. Examples of these tasks are controlling temperature, heating, and lighting settings.

Healthcare

Within the healthcare domain, Smart Living has the objective to prevent disease, monitor health, assist individuals with health issues or support individuals suffering from limited physical abilities (Solaimani et al., 2015b; Chan et al., 2008). The purposes are to improve health and healthcare quality, to improve independence, but also to reduce the social isolation to which individuals are subject (Chan et al., 2008). As these technologies, consisting of sensors, monitors and actuators, can help individuals within their residence, their habitual activities are not disturbed and, consequently, their well-being and comfort are affected in a positive way. Moreover, this form of healthcare is more cost-effective than conventional methods (Chan et al., 2009). This is relevant because the aging population increases healthcare costs. This makes the decentralization of healthcare from care facilities to homes increasingly viable. The devices are connected to a center which collects and processes the data. This center makes continuous diagnoses and follows up by taking adequate action. The devices monitor individuals continuously, both in- and outside their residences. This illustrates why the term *Smart Living* is more appropriate than *Smart Home* – the impact of these technologies extends beyond individuals' dwellings.

Safety & security

Safety and security of homes are enhanced by control of accesses and smarter monitoring of the home environment (Alam et al., 2012). Technologies such as motion sensors, fire alarms, automatic door locks, and video connections with other devices enable these abilities (Nikayin & De Reuver, 2015; Fernandes et al., 2016). It should be noted that, although these functions are conducive to a more safe and secure living environment, these devices are continuously connected to the rest of the world via Internet (Mantas et al., 2010). This opens new back-doors, which increases the potential for systems breaches. Hence, the implementation of Smart Living products and services also raises new security concerns.

Energy management

Within the energy management domain, Smart Living is interpreted as a new means of energy supply, (co-) production and consumption. This can lead to enhanced efficiency, reliability, and conservation of energy (Solaimani et al., 2015b; Zhou et al., 2016). Automation of in-home functionalities, such as ventilation, lighting, and heating, can lead to energy savings (Rohracher, 2001). These energy savings are also realized by adequate scheduling of device usage (Zhou et al., 2016). Smart Grid infrastructures and features, metering and monitoring devices, and energy storage units are believed to have the capacity to radically change the energy management of households. The implementation of these technologies is reinforced by the growing utilization and independent production of renewable energy.

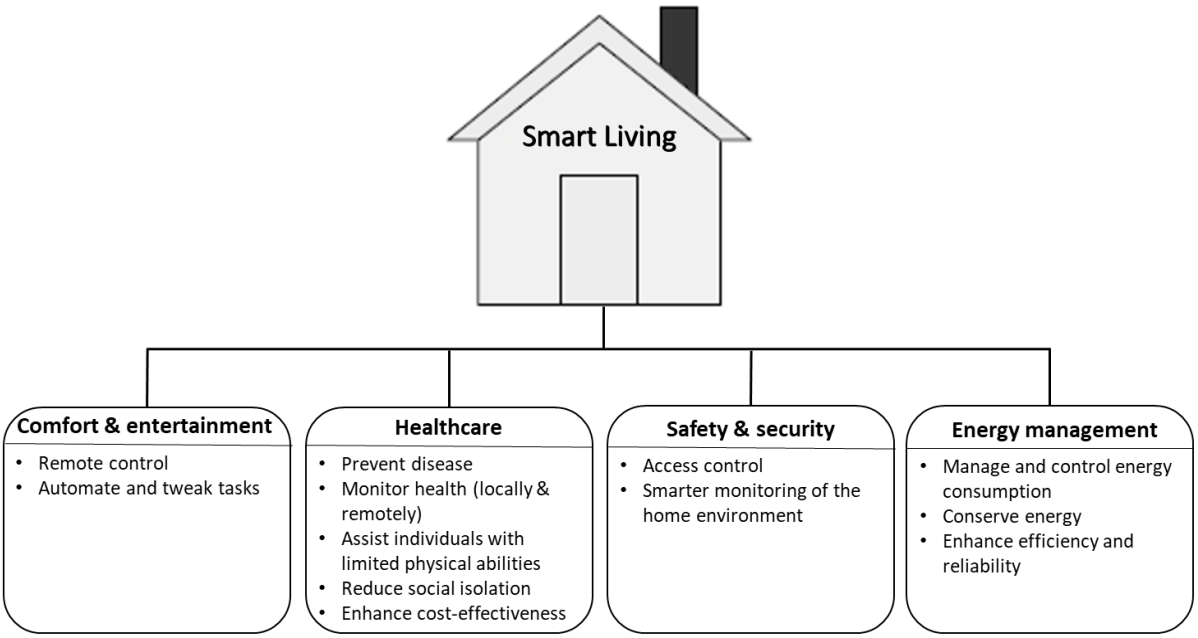

Figure 12 – Smart Living domains and their features. Based on: Alam et al. (2012).

Based on the above overview, the definition of Smart Living as introduced by Aldrich (2006) is reformulated as follows:

'Smart Living is defined as a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort and entertainment, healthcare, safety and security, and energy management through the management of technology within the home and connections to the world beyond.'

3.1.3. Smart Living market

At the end of 2018, 2.8 million households owned one or more Smart Living products or services. The figure below (*see Figure 13*) illustrates that the Dutch market for the energy management domain (energy & heating), the comfort & entertainment domain (lighting & switches, housekeeping & comfort, and smart speakers) and safety & security domain have grown. This data on consumer demand can be used to motivate the research case (*see paragraph 4.2*).

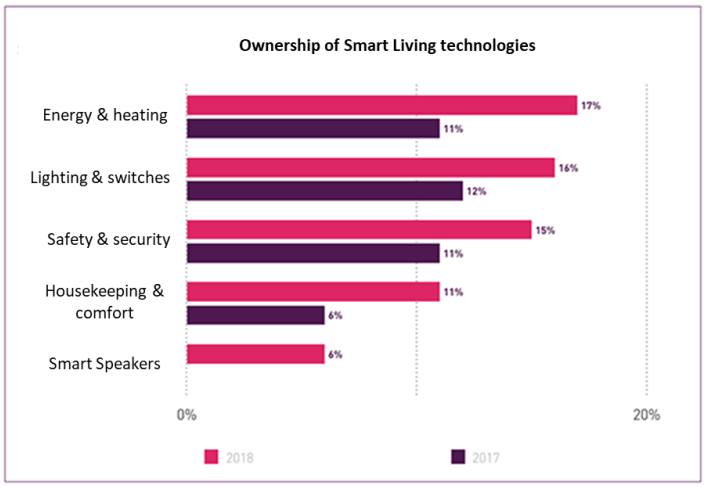

Figure 13 – Ownership of Smart Living technologies in the Netherlands. Source: Multiscope (2019).

3.2. Smart Living Ecosystem

First, the roles in a Smart Living Ecosystem are defined (*see paragraph 3.2.1*). Next, the commonalities of the four Smart Living domains are elaborated on (*see paragraph 3.2.2*). Based on this, it can be concluded that a service offering that relates to one domain is to a degree similar to a service offering that relates to the other domains of Smart Living. The next chapter introduces a research case that relates to just one domain of Smart Living. Delineating the domain commonalities is relevant because it justifies the generalizability of the case study. This implies that the result that follow from the case study – which relates to one domain – are to an extent also relevant for the other domains. Finally, the potential roles of telecom operators within the Ecosystem are elaborated on (*see paragraph 3.2.3*).

3.2.1. Roles

In order to realize a Smart Living service offering, it is essential to select partners that have the required skills and resources. Partners can play multiple roles, and sometimes partners having the same skills and resources can compete on roles to be played (de Reuver et al., 2009). For that reason, it is essential to select competent partners and make a role division that does not repel other (potential) partners.

Healthcare domain case study

Ehrenhard et al. (2014) performed a case study to visualize the actors of an Ecosystem of the Healthcare domain of Smart Living (*see Figure 14*). In doing so, they defined domain-specific roles, which are also visualized in the figure. Domain-specific roles are roles that apply to the examined domain specifically. Generic roles are relevant for all domains and thus apply to the Smart Living concept in general. Roles are also categorized as either primary or secondary. Primary roles are roles that are essential for a well-functioning Ecosystem (Ehrenhard et al., 2014). Secondary roles complement the primary roles and can enhance the value for the end customers but are not vitally important. In the figure below, the primary roles have a lined frame, and the secondary roles have a dashed frame.

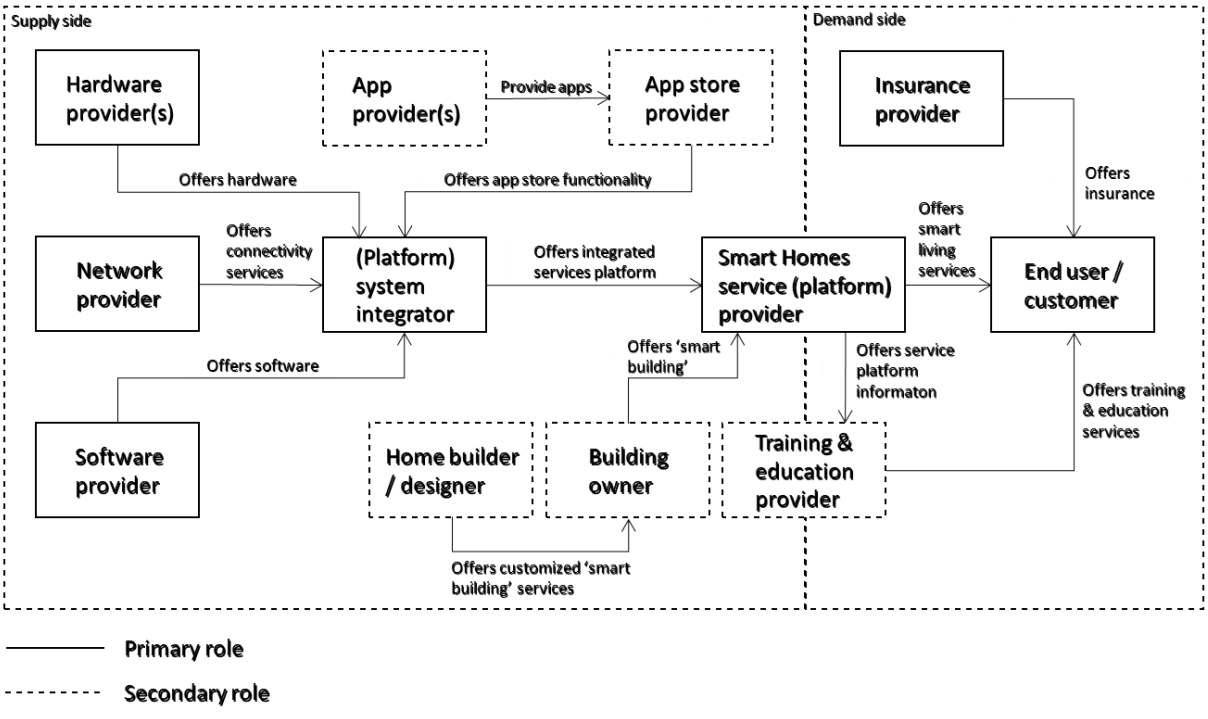

Figure 14 – Ecosystem of a service relating to the Healthcare domain. Adapted from: Ehrenhard et al. (2014).

Generalizing to the entire Smart Living sector

In order to establish the generic roles, the researchers first needed to establish the domain-specific roles for other Smart Living domains. The four domains the researchers specified are similar to the domains defined at the beginning of this chapter (*see paragraph 3.1.2*). Defining the domain-specific roles was done by conducting four or five semi-structured interviews with key actors in each domain. By synthesizing the information collected from the case study and interviews, generic roles could be defined. These roles are shown in the table below (*see Table 5*).

Table 5 – Generic Smart Living Ecosystem roles, activities and role categories. Source: Ehrenhard et al. (2014).

Role	Activities	Category
(Platform) system integrator	Integrates (hardware and software) technology	Primary
Customer	Pays for the product or service offered	Primary
End user	Uses the product or service offered	Primary
Hardware provider	Offers hardware	Primary
Network provider	Offers connectivity services	Primary
Smart Living service (platform) provider	Offers Smart Living services	Primary
Software provider	Offers software (platform)	Primary
App provider	Provides specific apps	Secondary
App store provider	Offers app store functionality	Secondary
Bank	Offers financial services	Secondary
Building designer / architect	Offers customized 'smart building' services	Secondary
Certification provider	Offers certification services	Secondary
Consultant	Offers consultancy services	Secondary
Contractor	Offers construction work	Secondary
Government	Determines regulation, privacy aspects, …	Secondary
Helpdesk provider	Offers support	Secondary
Home / building owner	Offers 'smart building'	Secondary
Home builder	Constructing building	Secondary
Private investor	Invests in the service	Secondary
Public investor	Invests in the service	Secondary
R&D provider	Research & development	Secondary
Retailer	Sells hardware	Secondary
Software developer	Develops software	Secondary
Technology standard provider	Offers technology standards	Secondary
Training & education provider	Offers training and education	Secondary
Video connection provider	Offers video connectivity	Secondary
White goods provider	Offers white goods	Secondary

3.2.2. Domain commonalities

At a high level of abstraction, there are several commonalities between the four Smart Living domains. In the previous paragraph (*see paragraph 3.2.1*), a general overview was given of the *primary* roles that are omnipresent in Smart Living propositions; regardless of the domain. These are: platform system integrator, customer, end user, hardware provider, network provider, Smart Living service platform provider, and software provider (Ehrenhard et al., 2014). In terms of functionality,

there are also similarities between the four domains. Key features regarding functionality are *monitoring* or *detection,* and subsequent *action* or *intervention.* Within the *comfort & entertainment* domain, continuous monitoring allows Smart Living technologies to start recognizing patterns in the behavior of residents and act by tweaking and automating tasks based on these patterns. Within the *healthcare* domain, residents are monitored by technology, and healthcare providers can intervene based on this incoming data. Within the *safety & security* domain, the in- and outside of the house are continuously monitored and, based on this, security providers and emergency services can intervene if needed. Finally, within the *energy management* domain, energy generation, sharing, and use are continuously monitored by, among others, smart meters. Residents or energy providers can use this incoming data to better manage energy. Within all domains, data collection is thus key. Sensors, monitors, and actuators are therefore always essential. This sensor data is subsequently centralized and shared. This corresponds with the technological elements that are omnipresent in Smart Living service offerings as introduced by Alam et al. (2012) (*see paragraph 3.1.2*). Any Smart Living service offering should have an internal network that provides connectivity and a gateway to connect dissimilar networks and thereby establish communication between appliances and residents, but also with other actors, such as healthcare providers, security providers, and energy providers, who can intervene based on the sensor data they receive if necessary.

3.2.3. The role of telecom operators

Until recently, providing telephony services was all that telecom operators did (Martucci & Elvidge, 2006). Video hire stores provided videos, and television companies provided television programs. Due to the rise of new technologies, firms have diversified their services, and specifically telecom operators have expanded their range of services. The development of digital services ensures that telecom operators do not have to offer each of their services and products in individual networks anymore. In updating these networks, telecom operators have to decide what kind of firm they wish to become. A key question here is what types of services they have to offer to keep their customers. In renewing these products and services, telecom operators also need to define what their Ecosystem will look like; and they need to update their strategies and underlying BMs. As argued by Kuebel et al. (2014), specifically telecom operators are tended to take a step towards the development of new services – such as Smart Living offerings – to revise their position in service Ecosystems. This line of reasoning is supported by Barlow & Venables (2003), who state that telecom operators develop systems that enhance connectivity and add additional services to their traditional service offerings. Telecom operators are expected to take a leading position in exploiting business opportunities of Smart Living offerings as they heavily invest in licenses and infrastructure. For that reason, researchers and telecom operators aspire to gain a better comprehension of these types of services. As argued before, they can however not offer these services individually.

Lack of expertise and legitimacy

Telecom operators lack the expertise and legitimacy to make an integrated Smart Living offering individually. This is because of several factors (Clinckx et al., 2013). Considering *insurance, security, and health*, telecom operators cannot independently establish insurance premiums or manage investments. Also, they do not have the expertise to guarantee the reliability of the equipment offered, to protect the data of customers, and to manage other risks for consumers. Considering *energy and utilities*, telecom operators lack the expertise to set adequate prices, manage failures or consumer energy consumption, or provide service delivery. Another factor is *technical support.* Telecom operators do not have the expertise to realize the architecture of the network, configure equipment, and to do advanced troubleshooting.

Interest by other industries

On top of telecom operators' lack of expertise and legitimacy to offer integrated Smart Living services individually, different types of industries also have ambitions to play roles in new business initiatives relating to Smart Living domains (Solaimani et al., 2015b). It is therefore questionable if telecom operators have a sufficiently strong strategic position to win the battle for customers individually, instead of cooperating with these actors. With regard to the *comfort & entertainment domain*, telecom operators, but also cable and media operators and hardware providers consider initiatives to attain the objective for houses to become entertainment centers. Considering the *healthcare domain*, healthcare providers have the ambition to offer remote medical assistance to the elderly or patients, and thereby reduce costs. Regarding the *safety & security domain*, security providers see new business in remotely controlled surveillance and safety devices. Finally, when looking at the *energy management domain*, energy providers intend to implement energy functionalities empowered by IT.

Potential roles

Because of the dependence on, and competition from other actors in Smart Living Ecosystems, Kuebel et al. (2014) introduce four roles that telecom operators may adopt in Smart Living offerings: system integrator, enabler, broker and neutral. If a telecom operator adopts a *system integrator* role, technological assets, the value proposition of the service offering, and relationships with customers are managed by the telecom operator. When acting as an *enabler*, the telecom operator manages a platform via which third parties can offer Smart Living services to customers. In a *broker* role, the telecom operator manages customer relationships and service offerings, but the platform is administered by a third party. Finally, when the telecom operator takes a *neutral* role, it neither manages customer relationships and service offerings, nor does it administer the platform. In accordance with the above, the table below *(see Table 6*) categorizes the telecom operator as either keystone or niche player based on three levels: customer relationships, service offerings, and platform administration.

Table 6 – Potential types of players a telecom operator can be in Smart Living offerings.

	System integrator	**Enabler**	**Broker**	**Neutral**
Customer relationships	Keystone player role	Niche player role	Keystone player role	Niche player role
Service offerings	Keystone player role	Niche player role	Keystone player role	Niche player role
Platform administration	Keystone player role	Keystone player role	Niche player role	Niche player role

System integrator

To exemplify, the situation in which the telecom operator fulfills a system integrator role is taken. In this case, the primary roles, as defined by Ehrenhard et al., (2014), can be fulfilled by the below actors (*see Table 7*).

Table 7 – System integrator roles. Source: Ehrenhard et al. (2014).

Role	**Activities**	**Potential actor**
(Platform) system integrator	Integrates (hardware and software) technology	Installation / system integrator company
Customer	Pays for the product or service offered	General: residents
End user	Uses the product or service offered	General: residents
Hardware provider	Offers hardware	Telecom operator
Network provider	Offers connectivity services	Telecom operator

Smart homes service (platform) provider	Offers smart homes services	Telecom operator
Software provider	Offers software (platform)	Software company

3.3. Conclusion

This paragraph presents the conclusions of this chapter. Smart Living is described as a residence with connected technologies able to anticipate and responds to occupants' needs. In this research, Smart Living is divided into four domains: comfort and entertainment, healthcare, safety and security, and energy management. Several *primary* roles are distinguished that should be present in an Ecosystem that relates to any of these domains: platform system integrator, customer, end user, hardware provider, network provider, Smart Living service platform provider, and software provider. Apart from that, various domain-specific roles are presented. Other commonalities between the domains are the notions of *monitoring* or *detection,* and subsequent *action* or *intervention.* Telecom operators are particularly tended to initiate Smart Living services. They however lack expertise and legitimacy to offer these services individually and must deal with other types of industries that have ambitions to play roles in new Smart Living business initiatives. Depending on this, the telecom operator can play different kinds of generic roles in the Ecosystem: system integrator, enabler, broker, or neutral.

4. | Research methodology

This chapter introduces the methodology of the research. To recap, the key objective of the research is to explore how an Ecosystem with a robust underlying networked BM for Smart Living offerings can be developed. What is central to this objective are the misalignments and conflicts in actor interdependencies and interactions that emerge, and how to cope herewith. The research aims to introduce a methodology to model these interdependencies and interactions in a dynamic way using the VIP framework and an SD approach. The objective of this is to reveal cause-and-effect relationships regarding the dynamic interactions between Ecosystem actors using metrics derived from the VIP framework. This is done to expose and visualize the alignment, misalignments, and conflicts in interdependencies and interactions between actors. First, the research approach is given (*see paragraph 4.1*). Then, the research case is introduced (*see paragraph 4.2*). Next, the selected interviewees and their contributions to the research are discussed (*see paragraph 4.3*). The fourth paragraph elaborates on the reasoning used to arrive at the results: abductive reasoning (*see paragraph 4.4*). Finally, the process framework is converted into a combined research and process framework (*see paragraph 4.5*). The research methodology and associated case study approach are prepared in accordance with guidelines from academic literature (Sekeran & Bougie, 2016; Yin, 2013; Cunningham, 1997; Stake, 2008).

4.1. Research approach

The central research question must be answered to achieve the research objectives. This can be done in a structured way by answering the six supporting questions that were introduced in the first chapter (*see paragraph 1.4*.2). How this is done is first addressed (*see paragraph 4.1.1*). Next, an approach is given for how the process framework that is core to the research can be enriched and better aligned with the research objectives (*see paragraph 4.1.2*).

4.1.1. Supporting questions

In this research, a qualitative study approach is followed in which primary and secondary data sources are combined. The primary data is collected using semi-structured interviews. The secondary data is collected by doing desk research and was introduced in the second and third chapter. Which data collection sources and instruments are used for each of the supporting questions is visualized in the table below (*see Table 8*).

Table 8 – Data collection sources and instruments for the supporting questions.

Supporting question	Data collection sources	Data collection instruments
1. What BM tooling relevant for the central research question can be found in academic literature?	Literature	Desk research
2. How can the process framework be specified to the Smart Living sector?	Literature & individuals	Desk research and semi-structured interviews
3. How can the process framework be used to constitute a more robust networked Business Model for Smart Living?	Individuals	Semi-structured interviews
4. How can the process framework be used to implement this more robust Business Model?	Individuals	Semi-structured interviews

5. Which tooling is still missing for realizing the research objectives?	Individuals	Semi-structured interviews
6. How can the defined process framework be applied to the research case?	Individuals	Semi-structured interviews

The first supporting question is intended to introduce tooling that is relevant to answer the research objectives. Desk research was conducted to explore the tooling described in academic literature, and to fit this tooling in a process framework. This framework and tooling were introduced in the second chapter (*see Figure 2*). The framework is however still generic and not specified to the Smart Living sector. Also, since the BM tooling that was introduced within the framework will be applied in novel ways, more information needs to be gathered on how this can be addressed. Primarily, it must be explored how the VIP framework can be integrated with an SD approach. Finally, for realizing the research objectives, there may still be missing stages and tooling that are essential to include in the framework. These matters are central to the second, third, fourth, and fifth supporting questions, and are primarily addressed by conducting semi-structured interviews. In the next section (*see paragraph 4.1.2*), an approach is given for how the process framework and associated tooling can be enriched and better aligned with the research objectives. Once this knowledge has been collected, it can be used as an input for the research case. Before being able to answer the sixth supporting question, exploratory interviews are conducted to define KPN's current (as-is) BM and how the telecom provider intends to renew its service offering. These interviews are conducted with individuals from both KPN and Accenture. Individuals within Accenture are relevant for this because Accenture has supported the development of the KPN SmartLife service in the past. The information gained from these interviews is used to motivate and define the research case (*see paragraph 4.2*). Next, industry experts and potential key Ecosystem actors are identified and interviewed to illustrate how the process framework can be applied to the research case. Finally, the results derived from these interviews are validated in validation interviews. This is core to the sixth supporting question.

4.1.2. Process framework

This paragraph introduces an approach for how the process framework and associated tooling (*see Figure 15*) can be enriched and better aligned with the research objectives. The text below the figure elaborates on the objectives of the data collection instruments for each stage in the framework.

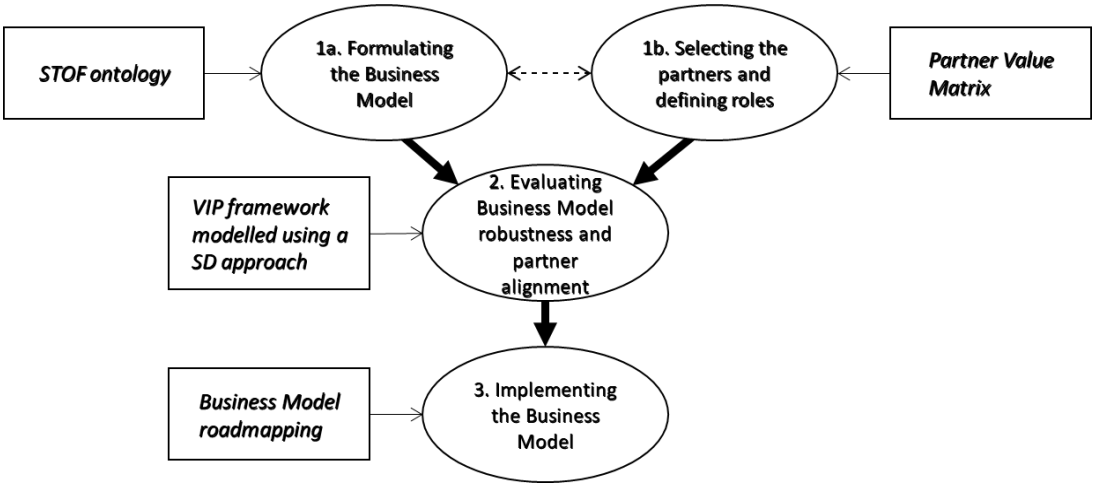

Figure 15 – Process framework.

1a. *Formulating the Business model*. The desk research introduced the STOF ontology (*see paragraph 2.1.3*) for this stage. Within this research, the focus is not on the definition of the entire BM using the four components of the STOF ontology, but on the *Organization* domain of the ontology. For that reason, no interviews with experts are conducted to delve into how a comprehensive Smart Living BM can be drafted using the STOF ontology. Since the focus lies with the *Organization* domain of the ontology, the VIP framework – that builds upon this component – is relevant in this research. The VIP framework is elaborated on below in the second stage: evaluating BM robustness and partner alignment.

1b. *Selecting the partners and defining roles.* The desk research introduced the Partner Value Matrix (*see paragraph 2.3*) for this stage. Interviews with BM tooling experts are conducted to gain a deeper understanding of how to define Ecosystem roles and select partners. The next paragraph (*see paragraph 4.2.2*) introduces the research case, which relates to the safety & security domain of Smart Living. For that reason, industry experts are interviewed to explore key resources, sales channels, funding, or other inputs that are specifically relevant for this research case. Next, the acquired knowledge can be used for the case that is central to this research. Interviews with potential key Ecosystem actors for the service offering of the research case are used to establish the mutual benefits of new partnerships. This is done by evaluating what the actors fulfilling the Ecosystem roles bring and what is in it for them at the levels of resources, sales, funds, and other inputs. This serves as an initial exploration if every partner is sufficiently motivated to engage in the partnership.

2. *Evaluating business model robustness and partner alignment*. The desk research introduced the SD approach (*see paragraph 2.4*) for this stage. Looking at the research objectives (*see paragraph 1.*3) there is not yet an approach with which interdependencies and relationships between different Ecosystem actors are modeled in a dynamic way to analyze Ecosystem partner alignment. For the realization of this objective, the VIP framework is integrated with an SD approach. This is where the focus of the entire research lies. Applying the VIP framework includes several steps, which need to be identified first. The challenge for the researcher is to then establish the next step: integrating this VIP framework in an SD approach. The challenges that are expected during the formulation of this step relate to the following questions: how can the dynamics be identified, how should the dynamic model be visualized, and what inputs are needed to draft this model? The objective of interviews with BM tooling experts to explore how this should be done. Next, research-case related information is collected to apply the previously defined steps to the research case. Interviews with industry experts are used to explore typical tensions in interactions and interdependencies between actors in a Smart Living Ecosystem. For this, industry experts are selected that are relevant for the research case (*see paragraph 4.2.2*) specifically. The knowledge collected can then be used as an input for semi-structured interviews with various potential key Ecosystem actors that can potentially fulfill the Ecosystem roles to point out which VIP variables are deemed essential by them. In other words, the researcher should evaluate which key interdependencies and interactions the potential key actors themselves expect at the level of value, information, and processes. Since the objective is to define the dynamics in interactions, it is essential for the interview candidates to apprehend the *time dimension* and be able to engage in *scenario thinking*. The assessment of different scenarios in which Ecosystem actors exchange values, information, and processes, is expected to expose the alignment and conflicts between them. The eventual objectives are to visualize alignment, misalignments, and conflicts in dynamic interdependencies and interactions between the Ecosystem actors by using an SD approach and to define activities to resolve the misalignments and conflicts. To support the process of defining these activities, the strategies for improving a BM's robustness as defined in the second chapter can be used (*see paragraph 2.4.2*).

3. *Implementing the business model*. The desk research introduced BM roadmapping (*see paragraph 2.4*) for this stage. The previous section concluded with the step of defining the activities to resolve the misalignments and conflicts in dynamic interdependencies and interactions between Ecosystem actors. BM tooling experts are interviewed to define how BM roadmapping can be used to sequence the activities that actors must undertake to resolve these inter-actor misalignments and conflicts. Finally, semi-structured interviews with potential key Ecosystem actors for the research case are conducted to apply this roadmapping process in practice.

4.2. Research case

Yin (2013) defines a case study as '*an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context*' (p. 16). This study has an explorative and qualitative nature as it attempts to explore key dynamics in inter-actor relationships in a Smart Living Ecosystem. A case study is deemed suitable for this qualitative approach because case studies usually concentrate on the collection and interpretation of qualitative rather than quantitative data (Sekaran & Bougie, 2016). This paragraph starts with the motivation for the research case (*see paragraph 4.2.1*). The starting point is that KPN intends to renew its SmartLife service. The *safety & security* domain is one of the features that KPN intends to further develop. The safety & security domain forms the core of KPN SmartLife because this is what the service initially started with. Also, there are various relevant Smart Living safety & security services on the market with significant installed bases as compared to Smart Living propositions, such as Achmea Homies (*see appendix III*), Interpolis Thuiswacht, and SecuritasHome. There is thus market pull for these types of services. For that reason, the defined research case relates to this domain (*see paragraph 4.2.2*). The Ecosystem roles for this case (*see paragraph 4.2.3*) are also elaborated on.

4.2.1. Case motivation

KPN started offering its SmartLife service in 2015. It is a white-labeled service provided by Deutsche Telecom (DT) via their Qivicon platform, which focuses on Smart Living value propositions. Via this platform, the hardware (including a large part of the devices to be connected), software, back-end communications, customer support, home hub, and mobile app are all included. It was already thoroughly tested and piloted by DT before KPN started offering it. SmartLife initially focused on the safety & security domain, but gradually added more services relating to the comfort & entertainment and energy management domain. The roles and actors for KPN SmartLife are shown in the below table (*see Table 9*). Trigion is included as a security provider to respond to the notifications generated by the sensor equipment installed in the residencies.

Table 9 – Roles and actors for KPN SmartLife. Source: Ehrenhard et al. (2014).

Role	Activities	Actor
(Platform) system integrator	Integrates (hardware and software) technology	Deutsche Telekom
Customer / end user	Pays for the product or service Offered / uses the product or service	Residents
Hardware provider	Offers hardware	Deutsche Telekom
Network provider	Offers connectivity services	KPN
Smart homes service (platform) provider	Offers smart homes services	Deutsche Telekom
Software provider	Offers software (platform)	Deutsche Telekom
Security provider	Offers security services	Trigion

Stagnated consumer base and new areas of interest

Despite the broad range of features of KPN SmartLife, the consumer base has stagnated. The causes of this are that the prices for service packages were perceived as too high by consumers, there were still bugs in the software, and only minor expenses were incurred for marketing the service. The choice was then made not to further expand the service, to stop significant investments, and keep the service running as an opportunity to learn and potentially expand at later stages. From a top-down perspective, there is however still interest in renewing the SmartLife service within KPN.

New areas of interest and service renewal

The business idea is based on the areas of interest for renewal or expansion of the SmartLife service from the perspective of KPN. From a top-down perspective, KPN is interested in renewing or expanding its SmartLife service with the aim to address a broader consumer base. First, KPN has shown interest in the healthcare domain. Due to increasing expenses for healthcare in the Netherlands, there is market demand for digitalization of healthcare services that KPN is interested in. Second, KPN has shown interest in further expanding services in the energy management domain. This is relevant for KPN because offering new smart meters and reducing energy consumption fits their sustainability objectives. Third, another area of interest is renewing the home security service, for which KPN currently has a partnership with security provider Trigion. Based on this input, the exact business idea, i.e. the service offering, is introduced next.

4.2.2. Case description

Based on KPN's areas of interest, the research case relates to the *safety & security* domain of Smart Living. As concluded from *Figure 13* in *paragraph 3.1.3*, the demand in the Dutch market for Smart Living technologies relating to safety & security shows a growing trend. What this domain entails was explained in the third chapter (*see paragraph 3.1.2*). The starting point of the research case is the definition of a service offering. The service offering is based on the KPN SmartLife service. In fact, it is very similar to the part of KPN SmartLife that relates to the safety & security domain, but now includes an extra Ecosystem role: the insurance provider. With this service scenario, KPN plays the role of system integrator (*see paragraph 3.2.3*). The proposition includes cameras and an IoT device that serves as a motion sensor and fire alarm within peoples' homes. The remote control room of the security provider instantly receives a notification if an alarm goes off. The security provider then contacts the residents of the house and gives them the option to send a security guard to check out the situation. The security provider also contacts emergency services if required. The service is offered together with an insurance providers' home and home contents insurance in a packaged deal. This way, KPN and the insurance provider can use each other's sales channels. Because this leads to the detection of fire and burglaries at an early stage, and adequate follow-up action by the security provider and emergency services, the service can prevent or reduce damage to the house and its contents. This could potentially lead to a reduction of claims for home and home contents insurance, which means that the insurance provider can offer customers of the service a discount for their home and home contents insurance premiums.

4.2.3. Roles and potential actors for the case

Based on the article by Ehrenhard et al. (2014) the following Ecosystem roles are key for the service offering (*see Table 10*). The actors that can potentially fulfill these roles are also included in the table. The figure below the table (*see Figure 16*) shows a generic picture of the key relationships between these roles. Again, the primary roles have a lined frame, and the secondary roles have a dashed frame.

Table 10 – Roles for this case. Source: Ehrenhard et al. (2014).

Role	Activities	Potential actor
(Platform) system integrator	Integrates (hardware and software) technology	Undefined
Customer / end user	Pays for the product or service Offered / uses the product or service	Residents
Hardware provider	Offers hardware	Undefined
Software provider	Offers software	Undefined
Network provider	Offers connectivity services	KPN
Smart Living service (platform) provider	Offers Smart Living services	KPN
Insurance provider	Offers insurance	NN Group
Security provider	Offers security solutions	Trigion
Emergency services	Offers security solutions	Police, fire department, and medical services

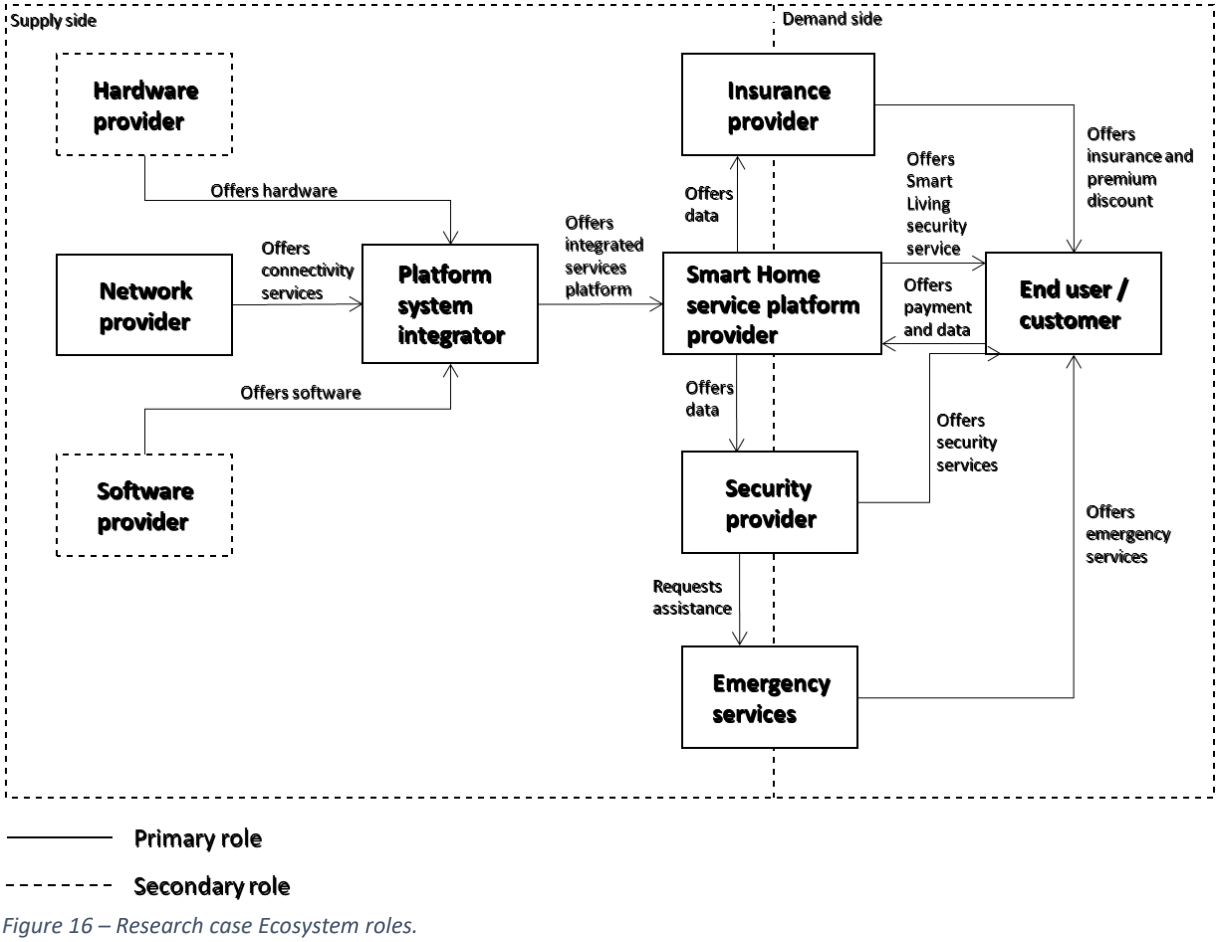

Figure 16 – Research case Ecosystem roles.

4.3. Interviews

Based on the research approach and research case, this paragraph introduces the selected interviewees. The interview protocol is included in the appendix (*see Appendix IV*). This protocol includes the actions taken by the researcher before, during, and after conducting the interviews. The steps in this interview protocol are the same for all interviewees. The interviewees were also asked to sign a participant consent form (*see appendix V*) which introduced them to the research

objectives, explained how they could contribute to the research, and asked for their consent to make voice recordings that are later deleted and not used for future research purposes. Because of GDPR, the form also informed the interviewees that personal information could intentionally or unintentionally be collected and that it is therefore their right to request access to, rectify, or erase the collected personal data. Additionally, they were informed that they would receive interview transcripts afterward; allowing them to rectify or erase personal data. All interviewees fully agreed with these terms. The interviews are divided into four categories, which follow a sequence that is visualized in the figure below (*see Figure 17*). This process is split up in a *theoretical input* stream, which focuses on the BM ontology and tooling (step 1), and a *research-case related input* stream, which focuses on how this BM tooling could be applied to the research case (step 2 and 3). Finally, the validation interviews were used to validate the results of the previous interviews (step 4). For that reason, this step touches on both the theoretical input stream and research-case related input stream. The logic behind this sequence is further elaborated on below the figure. The interviews that have been conducted were audio-recorded and then transcribed to text formats and, if necessary, translated. In these interview transcripts (*see appendix VII*), the questions asked by the researcher are not included. No use is made of data coding. Instead, quotes from these interviews are used to support the results. The next chapter presents these results.

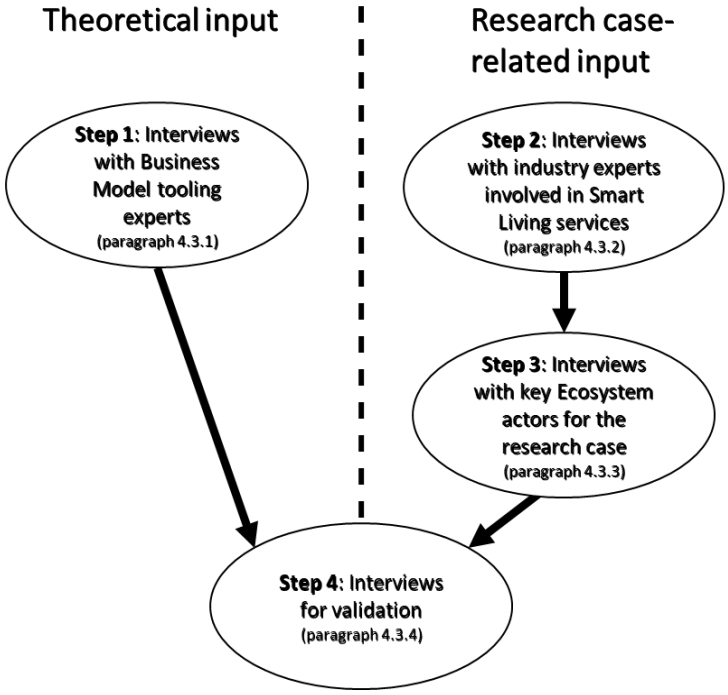

Figure 17 – Structure and sequence of interviews.

Step 1. *Interviews with Business Model tooling experts (see paragraph 4.3.1).* In the theoretical framework, a process framework with BM tooling was introduced that is useful for the achievement of the research objectives. This framework can however not be applied directly to the research case, as it still includes separate BM tools that need to be integrated, adapted, and specified to the Smart Living domain. As a first step, interviews with BM tooling experts were conducted to explore how the tools in the process framework could be linked to each other in such a way that one tool provided input for the next. In these interviews, it was also discussed how the BM tooling could be applied in novel ways. These novel applications refer to integrating the VIP framework with an SD approach and making the BM roadmap suitable for an Ecosystem of partners rather than for a single-firm perspective. During the interviews, it was also discussed how the process framework could be specified to the Smart Living sector (*see paragraph 4.1.2*); or more specifically, to the research case. The

interviews were also conducted to discuss limitations of the tooling, and which steps in the process framework were still missing for achieving the research objectives. Conclusive*, the purpose*s *of the step one interviews* are to sequence the tooling in the process framework, to apply it in novel ways, to specify it to the Smart Living domain and research case, to discuss limitations of the tooling, and to define missing steps of the process framework.

Step 2. *Interviews with industry experts involved in Smart Living services (see paragraph 4.3.2).* The previous step helps develop an updated process framework. The next step is to apply this process framework to the research case. For this, interviews with industry experts were conducted. *The purpose of the step two interviews* is to collect data with the intention of exploring typical tensions in interactions and interdependencies between actors in an Ecosystem relating to the research case. The interviewees are not familiar with this BM tooling, so this tooling and their use had to be explained to them first. The focus during these interviews was on alignment, misalignments, and conflicts in VIP-related metrics. The industry experts were asked to indicate where they thought the tensions between partners lie and how these should be resolved. Based on this input, the key output is as follows. First, a VIP interactions and interdependencies diagram was set up to visualize interactor relationships. Next, the dynamics in VIP-related components were visualized in causal diagrams. Then, activities were introduced to resolve the interactor misalignments and conflicts that emerged from this. Finally, an attempt was made to sequence these activities using a BM roadmap. A type of reasoning that the researcher and interviewees used to set up the causal diagrams is abductive reasoning; which can be regarded as *inference to the best explanation* (Sober & Elliott, 2013). This is further explained in the next paragraph (*see paragraph 4.4*).

Step 3. *Interviews with key Ecosystem actors for the research case (see paragraph 4.3.3).* Next, experts within organizations that could potentially fulfill the key roles for the research case service offering (*see paragraph 4.2.3*) were approached. This step is key to applying the process framework to the research case and drawing conclusions about the process framework. *The purpose of the step three interviews* is to, based on the input gained from interviews with industry experts involved in Smart Living services (step two interviews), collect new data to further delve into the alignment and conflicts between Ecosystem actors for the research case. The interview approach was similar to that of step two. The difference was that the researcher was now better informed about typical interactor alignment and conflicts for the Ecosystem of the research case and was therefore able to probe if the key Ecosystem actors indeed perceived these conflicts as relevant. Naturally, the researcher was open to other interactor conflicts that had not yet been discussed before. The input gained from these interviews was used to enrich the VIP interactions and interdependencies diagram, the causal diagrams, the activities to resolve interactor misalignments and conflicts, and the BM roadmap. The reasoning used here can also be designated abductive reasoning (*see paragraph 4.4*).

Step 4. *Interviews for validation (see paragraph 4.3.4).* This step was done after processing and drawing conclusions from the input gained from the previous three steps of interviews. As mentioned before, the literature and previous interviews allowed the researcher to formulate a process framework and apply it to the research case. *The purpose of the step four interviews* is to validate this approach and the conclusions drawn from its application. These interviews are used to validate if the conclusions drawn by the researcher are legitimate, credible, coherent, and inclusive. To validate this, the researcher showed the experts the VIP interactions and interdependencies diagram, the causal diagrams, and the activities to resolve interactor conflicts. The experts were then asked if they:

- recognized the patterns in the outputs and the conclusions drawn from this: does this make sense? If not, what would be more logical according to them?
- deemed these outputs and conclusions complete: are they comprehensive? If not, what is still missing?
- thought these outputs are precise: are they too generic? If yes, how can they be better specified?
- believed the outputs and conclusions are not subject to bias of the researcher and interviewees. If they are, what can be done to eliminate biased output?
- perceived that these outputs and conclusions are not subject to speculation or high levels of uncertainty. If they are, how can this be improved?
- could provide feedback on the practical relevance of the approach.

4.3.1. Interviews with Business Model tooling experts

The interviewee list is provided in the table below (*see Table 11*). A total of five candidates were approached via the networks of the researcher and first supervisor. All candidates agreed to participate. The interviews took between 45 minutes and one hour. Three interviews were conducted via Skype, and two were conducted face-to-face. One interviewee made minor amends to the interview transcript with the intention of further clarifying and elaborating on what was discussed during the interview. This feedback has been processed accordingly in the interview transcript (*see appendix VII.C*). After the five interviews were conducted, the researcher concluded that saturation point had been reached. The same themes recurred during the different interviews, and the researcher judged that enough input was generated to achieve the above objectives. For that reason, the decision was made not to address new interview candidates.

Table 11 – Interviewees for Business Model tooling.

Interviewee	Function	Organization	Key topic	Appendix
A	Researcher Business Models	Saxion University of Applied Sciences	Partner Value Matrix	VII.A
B	Director of MBA	Nyenrode Business University	VIP framework and SD	VII.B
C	System Dynamics expert	Delft University of Technology	VIP framework and SD	VII.C
D	Researcher IT platforms	Delft University of Technology	BM roadmapping	VII.D
E	Research Manager (networked) Business Models & Ecosystems	University of Turku	The process framework	VII.E

4.3.2. Interviews with industry experts

The industry expert interviewees are shown in the table below (*see Table 12*). Three candidates were approached via the networks of individuals within Accenture, and all of them agreed to participate. The interviews were conducted in a face-to-face setting and took approximately one hour. After three interviews, the researcher decided to further delve into the alignment and conflicts in the Ecosystem of the research case by approaching candidates within organizations that could potentially fulfill the key Ecosystem roles of the research case. That is what the next paragraph elaborates on.

Table 12 – Industry expert interviewees.

Interviewee	Function	Organization	Industry	Key topic	Appendix
F	Senior Manager Strategy	Accenture	Consulting	KPN SmartLife Ecosystem	VII.F
G	Product Manager	BeNext Smart Home	Smart Living	Smart Living safety & security Ecosystems	VII.G
H	Director Ecosystems	INNOPAY	Consulting	Achmea Homies Ecosystem	VII.H

4.3.3. Interviews with key Ecosystem actors for the research case

Candidates from both NN Sparklab, Trigion, and Securitas were approached and willing to cooperate (*see Table 13*). Five individuals from the departments of KPN dedicated to Smart Living (New Business and Consumer Market) were approached, but unwilling to cooperate. Based on correspondence with another KPN department, it appears that services such as KPN SmartLife receive little attention currently. The reason for this is that KPN's new strategy is aimed at improving connectivity. The current focus is on rolling out fiber and 5G technologies. This implies that KPN currently leans more towards the bottom-up perspective than the top-down perspective (*see paragraph 1.2.3*). As motivated in the appendix (*see appendix VI*), these organizations are all affiliated with Smart Living service offerings; specifically relating to the safety & security domain. Participating in the study is relevant to them because this enables them to explore what this Smart Living Ecosystem would look like, to conceptualize what conflicts could arise during the alignment of partners, and to think of how these conflicts can be resolved. To support the interviewees in reflecting on these matters, the researcher reasoned about this from his own point of view and discussed the input that was gained from industry expert interviews (*see paragraph 4.3.2*). The interviews took approximately one hour.

Table 13 – Research case Ecosystem interviewees.

Interviewee	Function	Organization	Role in research case Ecosystem	Industry	Appendix
I	Business Director of the Alarm Service Center	Trigion	Security provider	Security	VII.I
J	Project Manager SecuritasHome and Business Developer	Securitas	Security provider	Security	VII.J
K	Strategic innovator	NN Sparklab	Insurance provider	Insurance	VII.K

4.3.4. Interviews for validation

For the validation interviews, two candidates were approached who were both willing to cooperate (*see Table 14).* As motivated in the appendix (*see appendix VI*), these actors are affiliated with Smart Living services that relate to the safety & security domain. The interviews took approximately one hour.

Table 14 – Interviews for validation.

Interviewee	Function	Organization	Industry	Appendix
L	Deal Execution Senior Manager	Accenture	Consulting	VII.L
M	Deal Execution Associate Director	Accenture	Consulting	VII.M

4.4. Abductive reasoning

Abductive reasoning is a type of inference that attempts to find the most likely explanation for observations. This leads to a conclusion that is logical but, as opposed to conclusions drawn from deductive reasoning, cannot be verified. This implies that conclusions drawn from abductive reasoning have a degree of uncertainty to them. Abductive reasoning can thus be regarded as *inference to the best explanation* (Sober & Elliott, 2013). This form of reasoning is core to the integration of the SD approach and VIP framework. In the next chapter it becomes clear that, with an SD approach, a challenge is to find variables that are key for analyzing key Ecosystem dynamics. Observation during interviews led to the exploration of certain types of variables, and the causality between these variables constitute causal diagrams. With abductive reasoning the existence of these causal relationships cannot be verified. However, by using the interviews as an input, the objective of the researcher was to select the most likely causal relationships among the alternatives.

4.5. Combined research and process framework

A research framework delineates the essential phases of the research (Verschuren & Doorewaard, 2010). The process framework (*see Figure 15 in paragraph 4.1.2*) serves as a base for this research framework. Using desk research (*see chapters 2 and 3*) and four steps of interviews (*see Figure 17 in paragraph 4.1.4*) a combined research and process framework is set up (*see Figure 18*). The link to the supporting questions is indicated at the right-hand side. This framework contains five generic steps:

i. Establishment of the initial process framework based on desk research (*see chapters 2 and 3*).
ii. Establishment of an updated process framework based on interviews with BM tooling experts (*see paragraph 4.3.1*).
iii. Application of the updated process framework to the research case using interviews with industry experts and key Ecosystem actors for the research case (*see paragraph 4.3.2 and 4.3.3*).
iv. Validation of the approach and the results using interviews for validation (*see paragraph 4.3.4*). The approach used and results obtained from this research are also validated by comparing them with existing literature in which the Partner Value Matrix, VIP Framework, or other approaches for Ecosystems are applied. This literature is introduced in the next chapter.
v. Presentation of the research conclusions and recommendations.

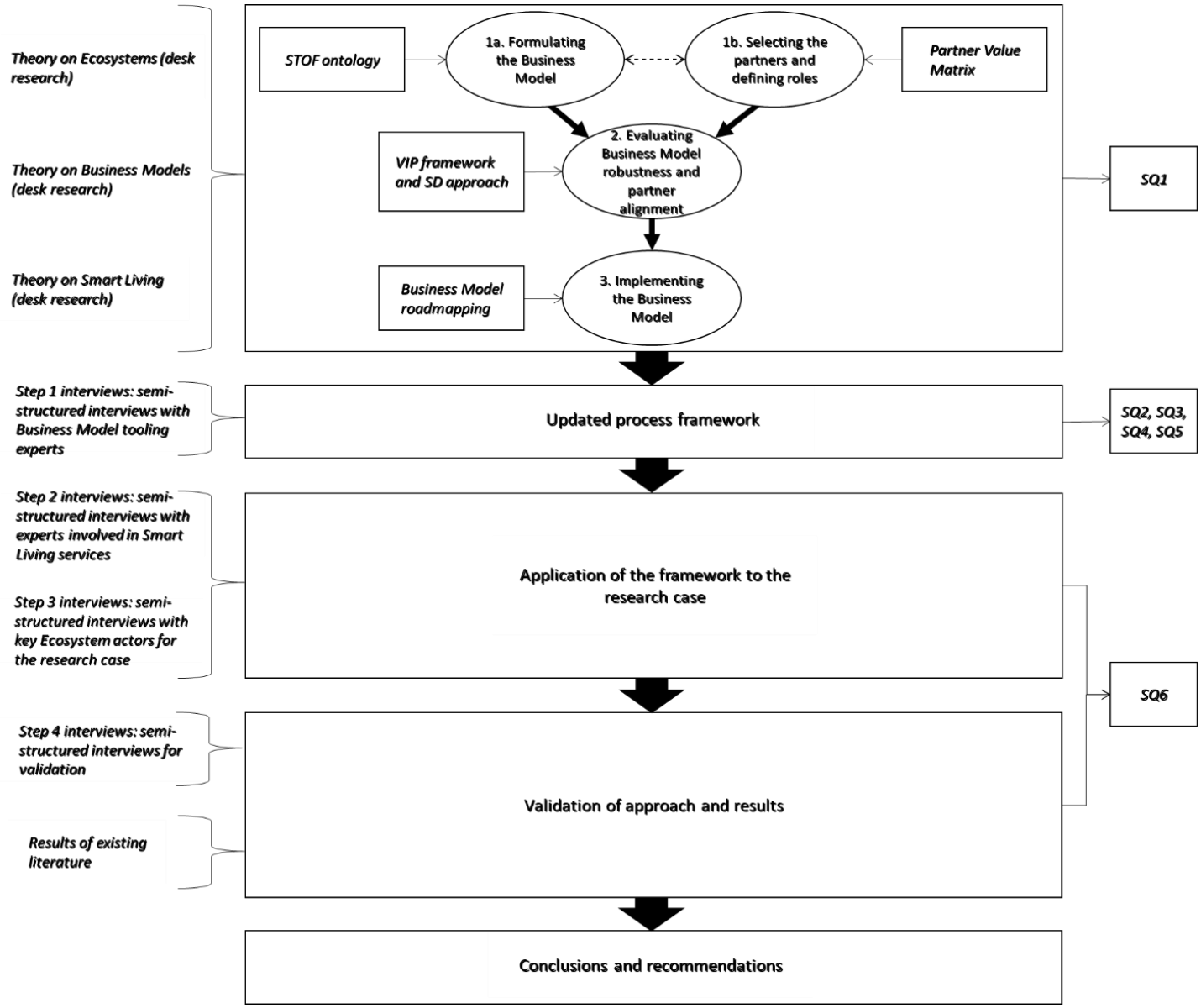

Figure 18 – Combined process and research framework.

5. | Results

This chapter presents the results of the research. First, the results regarding the process framework are discussed (*see paragraph 5.1*). Second, this framework is applied to the research case (*see paragraph 5.2*).

5.1. Updated process framework

This paragraph delves into the expert interviews for BM tooling, which were conducted with the objectives of connecting the BM tooling in the process framework and establishing an approach to apply the tools in a novel way (*see paragraph 4.3.1*).

"One tool should provide input for the next tool. Maybe you can skip a few more steps in the next tool. The scientific challenge lies in connecting the tools with each other." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

Other objectives were to define the limitations of the tools, and to find out how the process framework can be specified to the Smart Living sector and, specifically, to the research case. Finally, these expert interviews were used to evaluate which stages and corresponding tooling are still missing in the process framework for establishing a robust networked BM for Smart Living services. These expert interviews resulted in an updated process framework (*see Figure 19*). The stages in the framework are numbered one to eight. As concluded from the interviews (interviewee A; interviewee D) there are missing stages in the process framework for aligning Ecosystem partners that are deemed essential by the interviewees. These missing stages as derived from the interviewees' reasoning is included in the upcoming paragraphs. How the missing stages were identified is discussed there. The identified missing stages are as follows:

4. Evaluating the alignment of the actors' strategic objectives (*see paragraph 5.1.4*);
5. Evaluation of the extent to which their capabilities are complementary (*see paragraph 5.1.5*);
6. Evaluating the degree of trust between actors (*see paragraph 5.1.6*).

Interviewee E validated that these missing steps are indeed relevant and that there would be value in finding tools for these stages.

"It would be useful if there would be tools for doing these steps (evaluating alignment of strategic objectives, complementation of capabilities and the degree of trust). There could still be other missing steps in your framework but thinking about Ecosystem building I currently can't think of any." – Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku

Next, these three stages and the other stages of the updated process framework are elaborated on (*paragraph 5.1.1 to 5.1.8*) and conclusions are drawn from this (*see paragraph 5.1.9*).

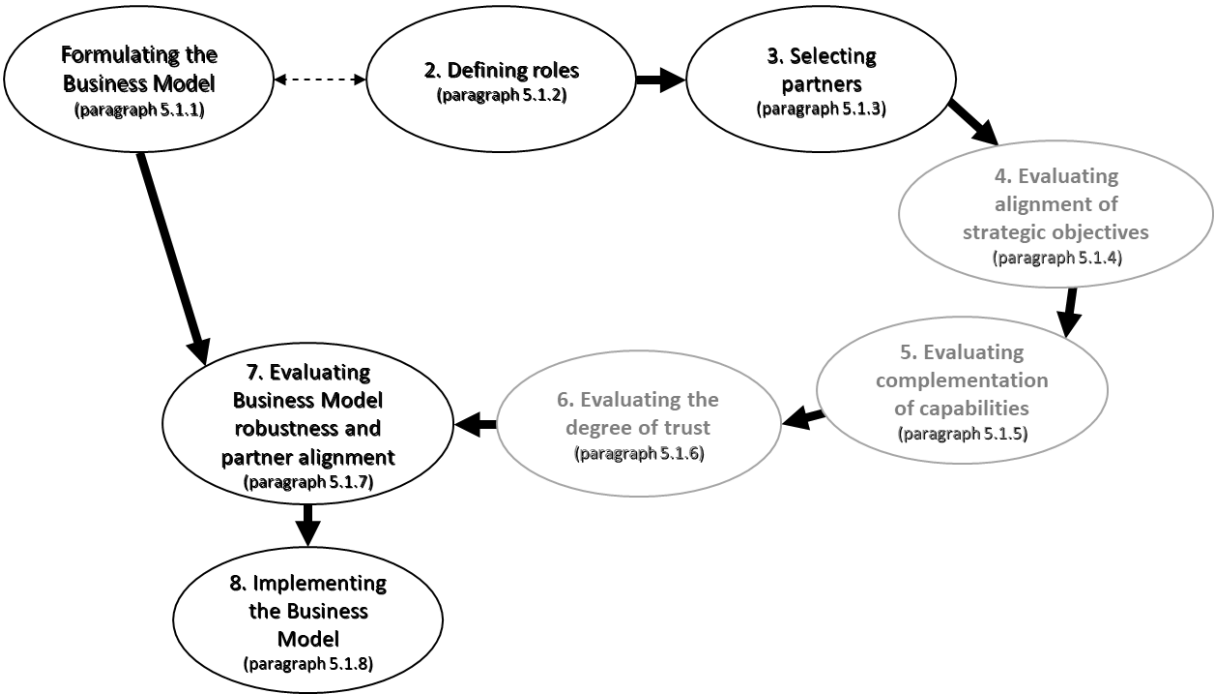

Figure 19 – Updated process framework.

5.1.1. Formulating the Business Model (1)

The BM can be formulated using the STOF ontology. The focus of this research, however, is not on the formulation of the entire BM but on the establishment of strategic collaborations and the evaluation of BM robustness. Therefore, the *Organization* domain of the STOF ontology is focused on.

5.1.2. Defining case-specific roles (2)

One of the interview objectives was to define how the process framework could be specified to the Smart Living sector and, specifically, the research case. To specify the framework to be applicable for the research case, the first step is to make a description of the research case, the history, and the background (interviewee E). This was done in the previous chapter (*see paragraph 4.2*).

"In your thesis you need to describe the case, the history, and the background. That is what I would do to specify the case to Smart Living." – Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku.

This, however, does not yet make the framework applicable to the research case. As concluded from the interviews, a way to further specify the framework to the research case while keeping it generic, i.e. applicable to other Smart Living domains or even other IoT domains, is to include the definition of case-specific roles as a separate stage in the framework (interviewee D). Consequently, the definition of case-specific roles is what this stage of the process framework (stage two) is meant for. For the research case, the article of Ehrenhard et al., (2014) was used to define case-specific roles. These roles were introduced in the paragraph on roles for the research case (*see paragraph 4.2.3*). The roles for this service offering were briefly described and, how these roles connected to one another was visualized in a figure (*see Figure 16).* This explicates on a generic level the dependencies between actors and the logic for each partner to cooperate in order to realize the service offering.

"What are typical roles in Smart Living? You have already done this. This is not necessarily a specification of the framework, but rather a background to the case. This can perhaps be included as a step in the framework: look at case specific roles." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

"The framework so far can still be used for all kinds of services; not specifically IoT services or even more specific: Smart Living services. This makes it interesting. The question then remains: you have applied it to a specific case in a specific domain. What does this mean for broader applicability?" – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

5.1.3. Selecting partners (3)

The next stage in the process framework is to find partners to fulfill those roles. This is what this paragraph delves into. As argued in the previous paragraph, a business role is generic and should be described first, before actors can be connected to these roles.

"A business role is a collection of activities to realize the Business Model. You can look at that separately from partners; focusing only on the roles. The following step is: if I have that generalized model, who will fulfill which roles?" – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

For the selection of partners, the Partner Value Matrix was introduced as a key tool (*see paragraph 2.3*). The Partner Value Matrix is applied to select Ecosystem partners based on the resources, sales channels, funds or other contributions they offer and receive. These four features recur in the VIP framework. Resources and sales channels are exchanged between actors using *processes* that have a certain *value* for actors (Heikkilä et al., 2015). Funds exchanged between actors relate to the *Finance* component of the STOF ontology, but since the exchange of funds between actors offers *value* to them, it is also considered part of the VIP framework (interviewee B). Other contributions, such as advice, service and support, can also be categorized as either value, information or processes. As acknowledged by interviewee A, the Partner Value Matrix can be used as a start, but it is not a profound tool. The Partner Value Matrix can therefore be considered as an initial and generic VIP analysis to select Ecosystem partners.

Since the Partner Value Matrix is a non-comprehensive tool, it can be used as a start for the partnership formation process by identifying the mutual benefits of new partnerships for each actor involved (interviewee A). The next step is to identify which actors can fulfill these roles. The Partner Value Matrix can be used to find actors to fulfill these roles and to eventually verify if all required roles are taken by actors. When assigning the roles to partners, various configurations can be established, and actors may fulfill multiple roles. This also holds true for the research case (*see paragraph 4.2.2*), in which KPN acts both as the network provider and the platform provider. It is a challenge to arrive at a sustainable configuration of actors. The Partner Value Matrix looks at this in a functional way; in terms of resources, sales channels, funds and other contributions every actor brings in and receives from others (interviewee A). What is however is not yet included and missing from an academic perspective is stages and corresponding tools to evaluate Ecosystems actors' alignment of strategic interests, complementation of capabilities, and trust between (interviewee A; interviewee D; Interviewee E). These three stages are included in the process framework and elaborated on in the next three paragraphs. However, these stages cannot be followed in a linear sequence, as they are subject to iterations (interviewee A; interviewee E) (*see Figure 20*).

"It is not always so tightly ordered to first define roles and then assign partners to the roles." – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

"What would company A like to receive from this joint effort? And the others? That flows logically, but there are still iterations in real life. It is not straightforward." – Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku.

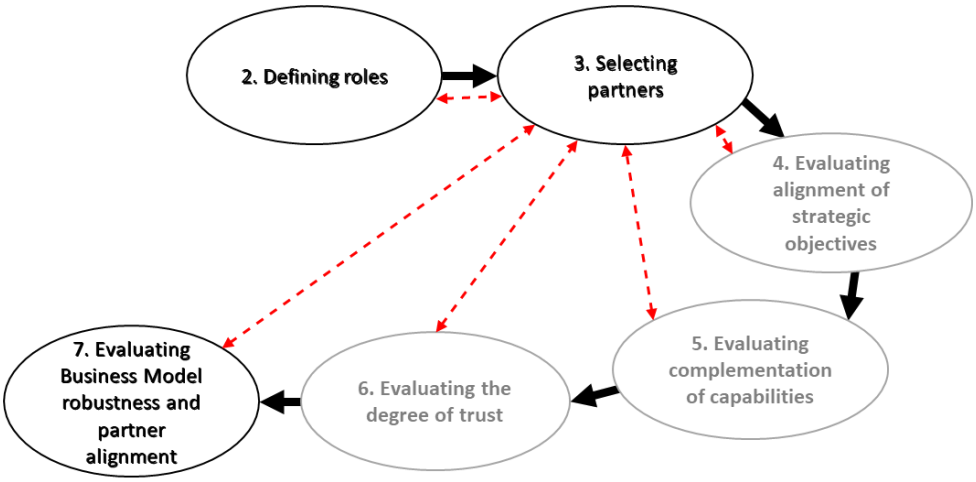

Figure 20 – Iterations between stages.

5.1.4. Evaluating alignment of strategic objectives (4)

A stage that the process framework should be expanded with is the evaluation of strategic objectives. When looking at Ecosystems, issues with strategic interests become relevant (*interviewee D*). The Ecosystem actors do not always express the strategic objectives that motivate them to participate in the service (interviewee A; interviewee E). Before strategic objectives can be aligned, actors should first share their individual strategic objectives with each other. As argued by interviewee D and E, this is highly dependent upon the degree of trust between partners, which constitutes stage six in the updated process framework (*see paragraph 5.1.6*). The formation of trust, however, takes time and requires multiple iterations of interactor contact in which they can gradually express more about themselves and learn more about the objectives of other actors. During this time, the actor's objectives become clearer, which allows the keystone actor and individual actors themselves to evaluate if the individual actors' strategic objectives match.

"This is very delicate in a way that sometimes companies are telling some truth about their objectives, but maybe they are not expressing everything. That is why it is done in repeated steps. During the project they get to know and can gradually express more as they learn more about the other companies." – Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku.

It could however be that some actors mainly participate with the intention to stall or frustrate the process of launching the new service (interviewee A; interviewee E). Also, some actors may not be willing to work with a certain other party, because they have no intention of making that party wiser (interviewee A). In this case, despite of the attempt of other Ecosystem actors to form trust and share strategic objectives, these actors do not intend to share their strategic objectives. No tools have been identified to evaluate the alignment of strategic objectives, but there would be value in designing or finding a tool for this (interviewee A; interviewee E).

"Up until now we have been trying to think of this in workshops and many other things; even acting, to share knowledge between the companies. If there would be tools, that would be useful." – Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku.

"Questions regarding strategic interests are: why should you participate? Why would certain actors want to play certain roles? You may have to deal with hidden agendas or partners that stretch or frustrate the process. Sometimes you prefer not to have a party on board because you don't feel the need to make that party wiser; despite the fact that the capabilities are present." – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

This BM tooling should tackle how the formation of trust can be stimulated, so partners share their strategic objectives more easily. Also, this tooling should give guidance in evaluating if actors' strategic objectives are aligned to realize the service offering. Finally, the tooling should give guidance on how the hidden agendas as discussed above should be exposed and what can be done to mitigate this risk. An option for this would be to prevent partner lock-ins by having several potential partners available that can provide a service (interviewee A).

"Regarding lock-ins you also have to take into account that, if you include a partner, you must be able to get rid of it. These are almost criteria based on which you would like to select partners. You do not want one partner who can provide a certain service. It is better to have several and to bring flexibility." – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

Strategic objectives, at least in part, are included in the VIP framework (*see Table 15*) (Heikkilä et al., 2015). For that reason, this research uses the VIP framework to evaluate strategic alignment between partners.

Table 15 – VIP metric for strategic objectives. Source: Heikkilä et al. (2015).

Metric	Relation to VIP
Strategic information availability ratio	Information

5.1.5. Evaluating complementation of capabilities (5)

Another stage to expand the process framework is the complementation of capabilities of the actors (interviewee A). This is not included in the Partner Value Matrix. For this, beforehand the role description as provided in *paragraph 4.2.3* should include the required capabilities to fulfill these roles. Next, it should be evaluated if the actors that will potentially fulfill these roles do indeed have these required capabilities.

"You can talk about the roles, but if you are looking for a partner, you should also look at what its capabilities are, and how it can be confirmed that this party's capabilities match the required capabilities for this role. A partner can contribute in terms of resources but that does not mean that it has the competencies to fulfill the role." – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

Complementation of capabilities is, at least partially, included in the VIP framework (see *Table 16*) (Heikkilä et al., 2015). For that reason, this research only uses the VIP framework to evaluate complementation of capabilities.

Table 16 – VIP metric for capabilities complementation. Source: Heikkilä et al. (2015).

Metric	Relation to VIP
Capabilities shared and exchanged among organizations	Processes

5.1.6. Evaluating the degree of trust (6)

As argued earlier (*see paragraph 5.1.4*), the degree of trust among Ecosystem partners is of essential importance for them to share and align their strategic objectives (interviewee A). No tooling was identified for this specific objective.

"A discussion that is now going on is that of Huawei and 5G rollout. The issue of trust is of great importance for the choice whether or not to engage in a partnership; despite the fact that regarding functionality and price it may be perfectly feasible." – Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences.

The evaluation of the trust among Ecosystem partners is, at least in part, included in the VIP framework (*see Table 17*) (Heikkilä et al., 2015). For that reason, this research only uses the VIP framework to evaluate complementation of capabilities.

Table 17 – VIP metric for trust. Source: Heikkilä et al. (2015).

Metric	Relation to VIP
Trust between network partners	Value

5.1.7. Evaluating Business Model robustness and partner alignment (7)

VIP framework

For the evaluation of partner alignment and BM robustness, the VIP framework was introduced (*see paragraph 2.1.4*). The dependent variable of the research is BM robustness, and the VIP framework exposes misalignments and conflicts in interactor dependencies and interactions that, when resolved, can enhance the robustness of the BM (interviewee B). For that reason, the VIP framework is core in the research and is concentrated on in applying the (updated) process framework to the research case.

"The VIP framework is a kind of lens through which you look at your Business Model to get order and to come to certain decisions: should we continue this and, if yes, under what conditions? What are the things that we need to fix to ensure a viable and feasible business model?" – Originator of the VIP framework and director of MBA at Nyenrode Business University.

The first action in applying the VIP framework is to define the first-tier actors (interviewee B). This coincides with the first step of applying the Partner Value Matrix (interviewee A), in which the potential partners that contribute to the service offering are defined. Because Smart Living is by definition a multi-actor sector, there can be various actors that play a role in realizing the service offering. The challenge is to separate the key actors – the primary partners – from other actors. This results in an empty VIP interactions and interdependencies framework.

"An important challenge is to identify the first-tier actors; who are the primary partners that make it possible to realize a value proposition?" – Originator of the VIP framework and director of MBA at Nyenrode Business University.

The next step is to have conversations with actors to define inter-actor interdependencies and interactions at the levels of value, information and processes. The actors must therefore indicate what they expect from other actors and what they offer themselves. For this, the actors must have a clear picture of their role in the Ecosystem and the roles of other actors. This generates a descriptive picture of basic relationships between actors. As a third step, it is advisable to have another interview with each actor and assess the diagram once again to work it out in more detail (interviewee B). Due to time constraints, within this research there was only be one interview round with key Ecosystem actors. During these interviews (*see paragraph 4.3.3*), together with the key Ecosystem actors the researcher assessed the VIP interactions and interdependencies diagram that was set up based on logical reasoning and the input from interviews with industry experts (*see paragraph 4.3.2*). During these interviews, the researcher attempted to let the interviewees reflect on misalignments and conflicts in interdependencies and interactions for certain scenarios. This is because actors often have different ideas of who is responsible when such a scenario occurs (interviewee B). This was also perceived as an issue for KPN SmartLife (interviewee I) Examples of such scenarios and resulting tensions between Ecosystem actors are elaborated on in upcoming paragraphs (*see paragraph 5.2.2 and 5.2.3*).

"People always have different ideas of who should be held responsible for certain problems. People are aware of issues that may arise but not who is responsible for them." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

"With KPN SmartLife there was a difficult and complex Ecosystem structure with numerous actors. It became more difficult in terms of demarcation which actor was responsible for what." – Business Director of the Alarm Service Center at Trigion.

Conclusions can be drawn from this regarding alignment and conflicts in interdependencies and interactions between actors. In other words, it generates a picture of what needs to be changed in the Ecosystem to improve interactor alignment and realize a more robust BM. This picture is however still static; it is a snapshot of the Ecosystem at a certain moment. For converting this to a dynamic model, the SD approach is useful.

SD approach

As argued in the second chapter (see *paragraph 2.4.2*), an essential part of modeling and analyzing Ecosystems is to apprehend the dynamics of the interactions that actors in this Ecosystem have (Tian et al., 2008). A challenge in this research is to identify these dynamics and visualize them clearly. This can be done by qualitative modeling. Qualitative modeling is relevant because it allows for the conveyance of the structure of this system and associated cause-and-effect relationships (Scott et al., 2014) (*see paragraph 2.4.2*). The SD approach can be integrated with the VIP framework to establish a dynamic model of VIP interactions and interdependencies. This approach adds on the original application of the VIP framework by including a time dimension. Ecosystem actors offer each other different values, information and processes. In most cases, all actors offer and receive something in return. If what the actor receives in return is however incomplete, the expectations are not complied with. This could then lead to different behavior of actors in the Ecosystem (interviewee B). These issues only come to light when looking at a certain timeframe in which actors interact rather than one instance.

"You have to start thinking in terms of a time dimension. I have taken a snapshot of a certain project; you have to make an animation." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

"A stakeholder delivers something, and expects something in return. Then he gets it back, but not yet complete. That undermines his expectations. Based on that, there is a different kind of behavior or

output, or it influences his wishes." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

Following the SD approach, the starting point is a system that shows problematic behavior (interviewee C). This is due to one or a few problematic variables, that should be identified first. Next, dynamic hypothesis are used to formulate potential consequences of feedback loops in the system. For this, causal diagrams are drawn up that illustrate the mechanisms that drive the dynamic behavior of the system. These steps constitute the qualitative phase of the modeling cycle. For conveying the structure of the system and cause-and-effect relationships in an SD approach, the first step is thus to identify key VIP-related variables that show – or have the potential of showing – undesired behavior (interviewee C). These metrics always need to be measurable and must be able to increase or decrease. An example of such a metric in the context of the research case may be the number of customers for the service. The second step is to look backward and identify metrics that influence this central metric, but also to look forward and identify which metrics the central metric influences. This is central to abductive reasoning (*see paragraph 4.4*). Using interviews as an input (*see paragraph 4.3.2 and 4.3.3*), the causal relationships that are most likely to exist are explored. The causal relationships are defined using both the reasoning of the researcher and the input from interviewees. These causal relationships are then visualized in causal diagrams, which could include feedback loops. This conveys how the central variables, or metrics, relate to each other and how they behave over time.

It should be visualized which variables relate to either *value*, *information*, or *processes* categories. The figure below (*see Figure 21*) shows how the dynamics can be visualized in a causal diagram. Value-related variables are given a green frame, information-related variables have a blue frame, and process-related variables receive a red frame. These colors are also indicated in a legend next to the diagram. Causal diagrams originally do not indicate the actors that are related to the variables, but the variables can be related to certain actors (*interviewee C*). It is essential in this research to indicate to which actors the variables are related. This is because potential conflicts in VIP interactions must be traceable to the specific actor or actors involved in these interactions. It must be made explicit in causal diagrams to which actors the variables relate because the initiative to solve these conflicts lies with these actors.

"With System Dynamics you look at variables instead of actors; so this is a very different perspective. I can imagine that this offers a different view and that you can say: you can relate some things to a certain actor, and some you cannot. You could use colors or another indication for this." – System Dynamics expert at Delft University of Technology.

"You say that there are relationships between value, information & process-like variables. There may be causality between different variables that fall within these categories." – System Dynamics expert at Delft University of Technology.

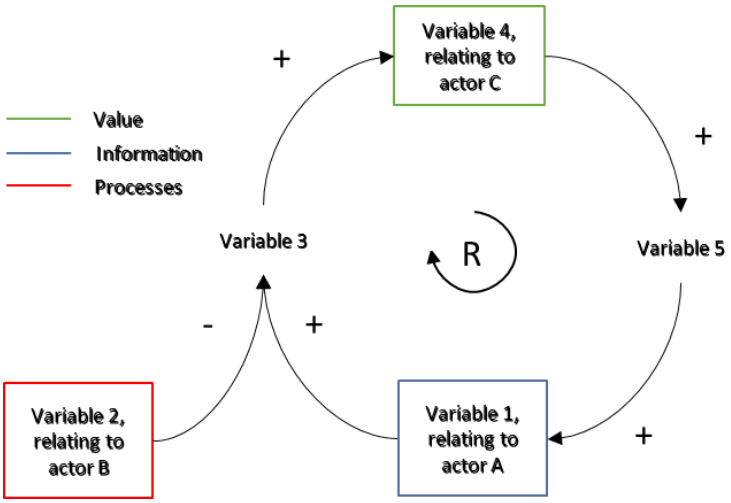

Figure 21 – Visualization of interactor dynamics.

Next to the value, information and processes categories, a fourth component is introduced. This component reflects the *value attributed* to changes in variables by Ecosystem actors; both service providers and consumers. As noted by the researcher, including this component allows for the visualization of where the value for each Ecosystem actor lies. Assessing this value conveys the logic of the service providers to engage in a collaboration. This establishes a stronger connection between the integrated VIP framework and SD approach and the STOF ontology, which delineates the underlying BM. The reason for this is that the focus of analysis of the STOF ontology is the creation of value for service providers and consumers (*see Figure 22*).

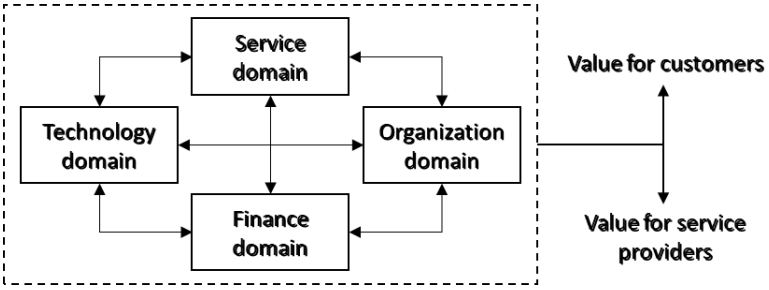

Figure 22 – Focus of analysis of the STOF ontology: value for consumers and for service providers.

It should be noted that the *value attributed* to the service, or certain features of it, is different from the *value exchanges* between actors. In applying the process framework to the research case, it became clear that actors (i.e. service providers and consumers) do not necessarily *attribute* value to the exchanges of value between each other. For instance, consumers prove to attribute little value to a reduction of insurance premium when purchasing such a service. To identify the feedback loops between the variables in the causal diagrams, it is therefore key to evaluate the *value attributed* to certain features of the service by service providers or consumers. The value attributed is visualized by a yellow frame in causal diagrams (*see Figure 23*).

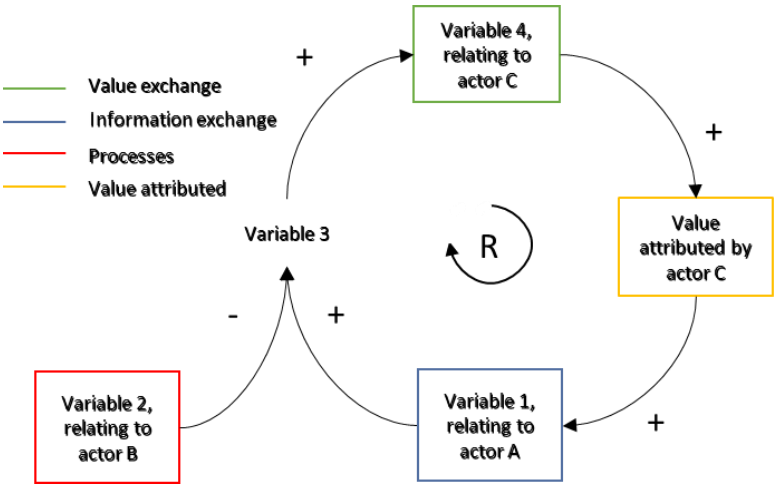

Figure 23 – Visualizing the value attributed to changes in variables by actors.

Having completed the causal diagrams, the third and final step is to evaluate how the variables can be influenced by certain activities. It may be advisable to influence the system by introducing a new feedback loop, because this often brings about a major effect and requires only little effort (interviewee C). This reasoning corresponds with that of Abdelkafi & Täuscher (2015), who state that introducing a feedback loop is a suitable strategy for enhancing a BM's robustness (*see paragraph 2.4.2*). *How* these activities should be implemented is a challenge that is overcome by applying BM roadmapping (interviewee D). This is what the next paragraph elaborates on.

"Often it is useful to impact the system with a feedback loop, because then you often have a big effect with little effort." – System Dynamics expert at Delft University of Technology.

5.1.8. Implementing the Business Model (8)

Reflecting on Ecosystem dynamics and the resulting misalignments and conflicts allows for decision-making that improves partner alignment (see *paragraph 2.4.2*). That is what the previous section elaborated on. In a networked setting, multiple actors have to change their individual BM to enhance the robustness of the *networked* BM (interviewee D). Originally, a BM Roadmap visualizes the intermediate activities required to make the transition from an *as-is* to a *to-be* BM (de Reuver et al., 2013). It thus describes the activities an actor or a network of actors should follow to arrive at the BM that is desired. This paragraph makes explicit the difference between the purpose of the original BM roadmapping approach and the purpose of the approach used in this research. The research does not concentrate on the changes to be made to all four STOF components of each actor individually to realize the launch of the service offering. In this approach, BM roadmapping is used only to structure the activities intended to resolve VIP misalignments and conflicts. Doing this in a structured way and with support from all Ecosystem actors allows for a more robust networked BM. As argued by interviewee D, this approach links the *analytical* VIP framework to the *plan-proces* of BM roadmapping. Hereby, a rather *conceptual* BM tool is reconciled with a more *practical* BM tool.

"My criticism on the VIP framework would be: it exposes up all kinds of issues, but how are you going to solve them? That last step is actually missing. The VIP framework is at best an analysis framework and not a "plan" framework. But roadmapping is. There are activities in Business Model roadmapping, which makes it more practical, but they are not linked to the VIP framework. The VIP framework is conceptually much better than the Business Model roadmap. The roadmap still lacks a bit of conceptual substantiation. If you can make the link between those two tools, then you solve a

problem with both." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

Because this analysis gives direct insight into the required BM changes of each individual actor to realize a more robust networked BM, the first two steps of the original BM roadmapping process – the definition of required BM changes and the effect of these changes on other BM domains (*see paragraph 2.5.1*) – do not need to be included (interviewee D).

"You have already done that VIP analysis. You already know what the Business model should be, you already know what comes out of the Partner Value Matrix, so you actually have the first two steps of the roadmap. Shouldn't you deduce from this what the activities are? The VIP analysis mainly shows what the problems are; what are the conflicts regarding value, information and processes domains. You have to do something about these conflicts in your roadmap activities." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

"As with a normal Business Model roadmap, with a networked Business Model roadmap you need to map the Business Models of the (structural) partners in the Ecosystem separately. What is extra is the link between those Business Models, and what issues are raised during the process. This is a result of the VIP analysis." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

The third step of the BM roadmapping process – the establishment of *activities* – is also included in the integrated VIP framework and SD approach. Although interviewee D states that the formulation of these activities should be part of the BM roadmap, that step is also part of applying the SD approach (interviewee C), as described in the previous paragraph. The third step of the original BM roadmapping process is therefore also not included.

"From the VIP framework you can conclude: where are the problems? You will then solve these problems in the BM roadmap. These are activities to bring about change in the Business Model." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

The fourth and final step of the roadmapping process – backcasting the desired transition trajectory and visualizing the activities in a roadmap – can be applied to sequence the activities that are required to solve conflicts in dynamic interactions between actors. A challenge for a networked BM is to define who should be the first to act (interviewee D). For the research case, the intention was to discuss this with industry experts (*see paragraph 4.3.2*) and key Ecosystem actors (*see paragraph 4.3.3*). During these interviews, together with individuals the researcher attempted to discuss what this sequence should be. As will be discussed in the next paragraph, the variety of topics that had to be discussed in the interviews – which were of relatively short duration – led to the fact that BM roadmapping could not be discussed elaborately.

"The first question is who should be the first to take action, and what are the interdependencies between actors? That is extra when comparing it to a Business Model roadmap for a single-firm perspective. From the VIP framework you get extra input related to the networkedness." – Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology.

5.1.9. Conclusion

The table below (*see Table 18*) concludes this paragraph. It briefly discusses the different stages of the updated process framework, their purposes, and the tooling to be used for each stage. It also

reveals the detailed steps that are followed to apply the updated process framework to the research case. This is done in the next paragraph.

Table 18 – Steps for the research case.

Stage	Purpose	Tooling	Explanation	Steps for research case
1	Formulating the Business Model	STOF ontology	The first stage is to formulate the BM using the STOF ontology. Stages two up until six are specifications of the *Organization* domain of the STOF ontology.	
2	Defining roles	No dedicated tooling identified	A description of the research case, the history, the background, and case-specific roles based on literature	**1:** Role definition using the article by Ehrenhard et al., (2014)
3	Selecting partners	Partner Value Matrix	The Partner Value Matrix helps select partners based on the resources, sales channels, funds or other contributions they offer and receive	**2:** Select partners
				3: Evaluate how each partner contributes
				4: Evaluate what each partner gains
4	Evaluating alignment of strategic objectives	No dedicated tooling identified – partially included in the VIP framework	Dedicated tooling would be useful to evaluate alignment of ecosystem actors' strategic objectives	
5	Evaluating complementation of capabilities	No dedicated tooling identified – partially included in the VIP framework	Dedicated tooling would be useful to evaluate complementation of capabilities	
6	Evaluating the degree of trust	No dedicated tooling identified – partially included in the VIP framework	Dedicated tooling would be useful to evaluate the degree of trust between actors	
7	Evaluating Business Model robustness and partner alignment	VIP framework and SD approach	The focus of the research is on this stage. First, the VIP analysis is executed. The interactor alignment and conflicts are visualized using key SD tooling called causal diagrams. The conflicts between Ecosystem actors that are visualized in these diagrams can be eliminated by means of activities to be executed by designated Ecosystem actors	**5:** Draw an empty interactions and interdependencies diagram which includes the key actors
				6: identify the key interactions and interdependencies; and include them in the diagram
				7: identify the alignment and conflicts in static and dynamic interactions and interdependencies; and visualize them in causal diagrams
				8: evaluate how the variables that constitute

				conflicts can be influenced by certain activities
8	Implementing the Business Model	BM roadmapping	The activities that emerge from the previous stage are sequenced in a BM roadmap	**9:** backcast the desired transition trajectory and visualize the activities in a roadmap

5.2. Research case

This paragraph follows the nine steps as established in the previous paragraph (*see Table 18*). The literature introduced in the first three chapters, the reasoning of the researcher and the knowledge gained from interviews with industry experts (*see paragraph 4.3.2*) and key Ecosystem actors for the research case (*see paragraph 4.3.3*) are used as an input for this. The input from the validation interviews (*see paragraph 4.3.4*) is also included in this paragraph. The steps to be taken for applying the updated process framework to the research case, and corresponding paragraphs, are visualized in the table below (*see Table 19*). The role definition and partner selection steps were already done in the previous chapter (*see paragraph 4.2.3*), because this was used as an input for the selection of interview candidates. The first paragraph of shows how the Partner Value Matrix is applied to select Ecosystem partners based on the resources, sales channels, funds or other contributions they offer and receive (*see paragraph 5.2.1*). The next two paragraphs visualize the alignment and conflicts in interactions between these actors (*see paragraphs 5.2.2* and *5.2.3*). Based on this, the activities to resolve the conflicts are elaborated on (*see paragraph 5.2.4*). The final step is to apply the BM roadmapping tool to sequences these activities. Since this tool was not elaborately discussed during the interviews, it could only be applied using the reasoning of the researcher. Such a one-sided analysis makes it subject to bias and leads to deficiencies in the analysis (Sekeran & Bougie, 2016). Conclusively, the approach lacks rigor and is therefore taken up in the appendix (*see Appendix VIII*). The recommendations for further research on applying BM roadmapping are included in the conclusion and discussion chapter (*see paragraph 6.5*).

Table 19 – Research case steps and corresponding paragraphs.

Step	Purpose	Paragraph
1	Role definition using the article by Ehrenhard et al., (2014)	**4.2.3:** Roles and potential actors for the case
2	Select partners	**5.2.1:** Partner Value Matrix
3	Evaluate how each partner contributes	
4	Evaluate what each partner gains	
5	Draw an empty diagram which includes the key actors	**5.2.2:** VIP analysis – interactions and interdependencies diagram
6	Identify the *static* interactions and interdependencies; and include them in the diagram	
7	Identify the *dynamic* interactions and interdependencies; and include these in causal diagrams	**5.2.3:** VIP analysis – causal diagrams
8	Evaluate how the variables can be influenced by certain activities	**5.2.4:** Activities
9	Backcast the desired transition trajectory and visualize the activities in a roadmap	**Appendix VIII:** Business Model roadmap

5.2.1. Partner Value Matrix

The Partner Value Matrix (*see Table 20*) for the research case was set up by the researcher and supported by interviews with industry experts (*see paragraph 4.3.2*) and key Ecosystem actors for the research case (*see paragraph 4.3.3*). As explained by interviewee A, the tool can be used as a start to explicate the logic of the key Ecosystem partners to engage in a partnership. In contrast to the example of the Partner Value Matrix being applied in practice (Haaker et al., 2018), below matrix includes customers of the service offering as a key actor. Although customers are defined as *actors* and not *partners*, including them gives a comprehensive overview of what the customer receives from the service; and in which ways the customer offers value to the key service providers.

KPN

KPN acts as a keystone actor in the Ecosystem and provides the central platform, the hardware, software (including the mobile application), connectivity, IT service management, customer help desk, and the integration of the functions. KPN also allows Trigion and NN group to win new customers by opening sales channels. In return, KPN benefits from gaining new clientele from sales channels of NN group. As a compensation for the service, KPN receive the user data collected by sensors in the IoT device, and a fee from consumers for the use of the service. This role of KPN is similar to KPN's current role in the KPN SmartLife service.

"If you take KPN as a case, you will notice that they have an advantage over the rest of the world; at least looking at the Netherlands. They have a huge installed base and customer reach. If KPN fails to bring a good product like this to the market, nobody can. It is a reliable party that is trusted by the customer. All necessary conditions are present." – Business Director of the Alarm Service Center at Trigion.

NN Group

NN group provides insurance and offers customers a discount on their insurance premium if they purchase the smart security service from KPN. Also, NN Group provides the opportunity to increase KPN's and Trigion's clientele by promoting the service via their sales channels. In return, NN group benefits from KPN's sales channels and aims to reduce the insurance claims from consumers. Also, they receive sensor data from users which they can use to run analytics on.

"I understand that an insurance company wants a broad proposition; they are looking for new revenue models." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"Nationale Nederlanden have always been interested in data. Insurers, however, do not yet know exactly what they want with the consumer data." – Product Manager at BeNext Smart Home.

Trigion

Trigion offers security services by responding to the notifications the smart security service generates. In return, they benefit from using KPN and NN group's service channels to attract new customers, receive sensor data from users, and receive a compensation for the security services they offer on a pay-per-use basis. This role of Trigion is similar to Trigion's current role in the KPN SmartLife service.

"Trigion has a physically manned control room with which they can keep an eye on everything. They also wanted to offer services to consumers." – Former Solution Architect at KPN SmartLife and Senior Manager at Accenture Strategy.

"I think it is very important to look for partnerships for these types of products, because a KPN, Tele2, or T-Mobile are better known than a security company" – Project Manager SecuritasHome and Business Developer at Securitas.

Customers

Customers give permission to KPN, NN group and Trigion to use the data collected by sensors in the IoT device. Also, they provide feedback regarding the value of the service and potential improvements. Additionally, they pay the insurance fee and must stay with NN group as an insurer to receive a discount on their insurance premium in exchange for using KPN's smart security service. They benefit from using the smart security service; thereby obtaining a safer home environment and, potentially, an insurance premium discount.

"An early notification of a fire can ensure that the average claim burden is reduced by approximately seventy percent". – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"An option for the service you specified could indeed be if the insurer offers the consumer a discount. You can expect a premium reduction since I make life easier for my insurer." – Project Manager SecuritasHome and Business Developer at Securitas.

Table 20 – Partner Value Matrix.

Partners	What do they bring?				What is in it for them?			
	Resources	Sales channels	€	Other	Resources	Sales channels	€	Other
KPN	Smart Security service platform; connectivity	Share sales channels with NN Group & Trigion			Sensor / user data	Use sales channels of NN Group	Fee from customers	
NN Group	Insurance	Share sales channels with KPN & Trigion	Discount on insurance premium		Sensor / user data	Use sales channels of KPN	Insurance premium; reduction of damage claims	
Trigion	Security services				Sensor / user data	Use sales channels of KPN & NN group	Compensation for security services on a pay-per-use basis	
Customers	Sensor / user data		Insurance premium; fee for smart security service	Feedback on the value of the service	Smart security service		Insurance premium discount	Safer home environment

5.2.2. VIP analysis – interactions and interdependencies diagram

This paragraph discusses the application of the VIP framework. To conceptualize this, the VIP interdependencies and interactions diagram is given first (*see Figure 24*). This diagram is set up by the researcher based on the input from interviews with industry experts (*see paragraph 4.3.2*) and is validated and improved using the interviews for validation (*see paragraph 4.3.4*). Here, the *value*, *information* and *process* interdependencies and interactions between the Ecosystem actors are visualized.

"I used to work with value exchange graphs. That is very similar to this diagram. In these graphs you explicitly define the product or service, and the value that I get back from it. I cannot think of another another method to make that visible; because you have to be able to describe actors and their actions. The image seems to be logical." – Deal Execution Associate Director at Accenture.

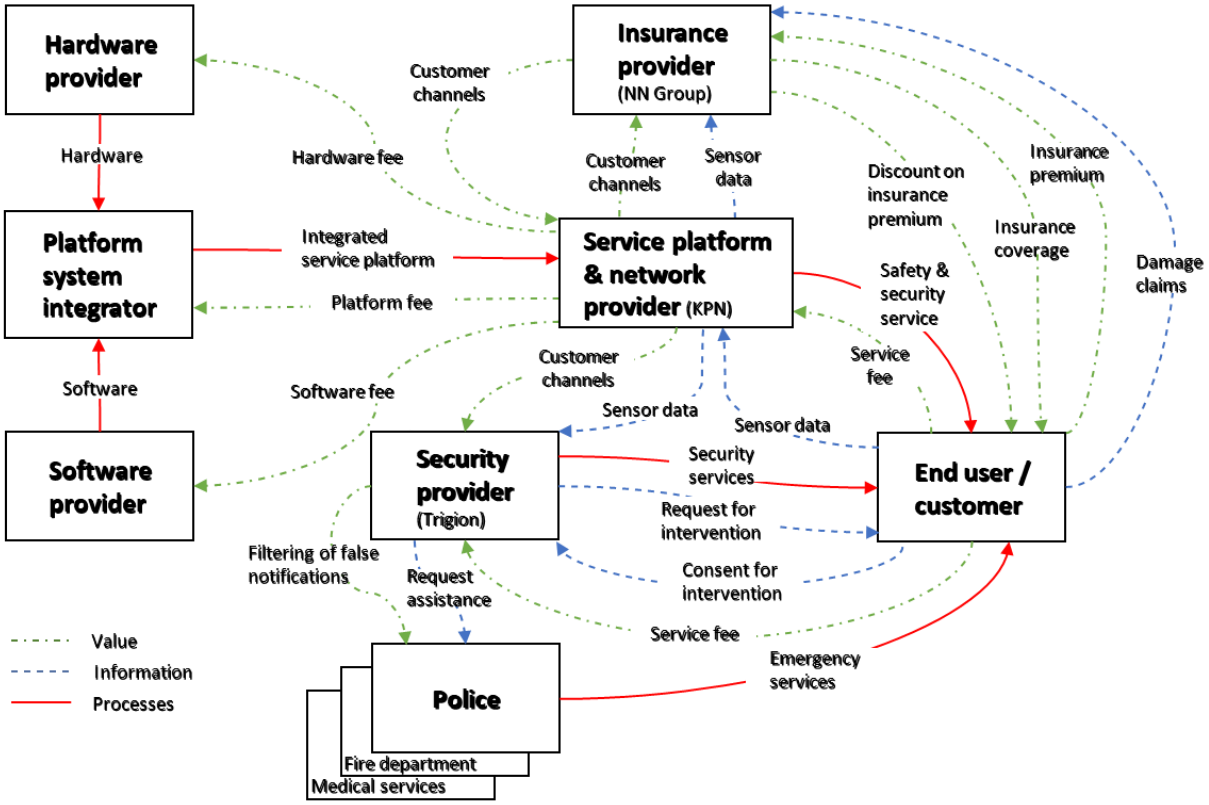

Figure 24 – VIP interactions and interdependencies diagram.

This diagram is the basis for the causal diagrams. Whereas the VIP interactions and interdependencies diagram visualizes *static* (i.e. non-time-related) dependencies and interactions between actors, causal diagrams are used to expose *dynamic* dependencies and interactions. The term *dynamic* relates to a time dimension, since it describes how actors react to each other over time. How they react to each other can be visualized by the increase or decrease of *variables*. However, causal diagrams are not only usable to conceptualize how certain valuables relate to each other over time, but also visualize the causality between variables at one instance; i.e. a static perspective. This is elaborated on in the next paragraph (*see paragraph 5.2.3*).

"You have to start thinking in terms of a time dimension. I have taken a snapshot of a certain project; you have to make an animation." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

The diagram is similar to other VIP interactions and interdependencies diagrams in literature (Solaimani, 2014; Frijns, 2016). The key difference is that, in this literature, the end customer is not included. Interviewee B argues that this was to preserve the novelty of the VIP framework; because otherwise it would touch upon other widely researched topics.

"The customer is extremely important, but I have left this out of the interaction to preserve the novelty of the research. With value interaction with customers you will quickly end up with usability studies, pricing, customer journey, requirement management, service-dominant logic, etc. These are

very widely researched (often marketing-oriented) topics." – Originator of the VIP framework and director of MBA at Nyenrode Business University

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However, since the unit of analysis of this research is *the BM of a service offering as constituted by an Ecosystem of actors* which, as argued earlier *(see Figure 7 in paragraph 2.2.1),* includes the end customer. The main reason for including end customers is because the they must also be included in the causal diagrams. When setting up the causal diagrams (*see paragraph 5.2.3*), it was concluded that the VIP interactions and value attributed by *service providers* cannot be detached from the VIP interactions and value attributed by *consumers*. Feedback loops only occur when including exchanges between both service providers and customers. The need to include the end customer in causal diagrams to establish these feedback loops is reflected by the following example mentioned by interviewee B:

"Very concretely: we are in a project and your analysis, which I need, depends on the validity and completeness of my data. You receive data from me, and the quality of data influences your analysis. Your analysis then provides certain insights with which a third party can do certain things, with which the customer becomes happy or unhappy. That could have an impact on the number of requests that I receive." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

5.2.3. VIP analysis – causal diagrams

Next, the causal relationships between interactions in the Ecosystem are elaborated on. As mentioned earlier (*see paragraph 5.1.7*), this can be visualized in causal diagrams (interviewee C). These diagrams are based on the input from interviews with industry experts (*see paragraph 4.3.2*) and interviews with key Ecosystem actors (*see paragraph 4.3.3*) and are validated by interviews for validation (*see paragraph 4.3.4*). The diagrams include measurable variables, and the actor to which the variables can be linked is indicated in the text. A colored frame indicates whether the variable is related to the categories *value* (green), *information* (blue), or *processes* (red). The additional category, *value attributed* (yellow), is also included. As argued by interviewee B, often the conflicts arise when problems or unexpected events occur (*see paragraph 5.1.7*). This is because actors often do not know who should be held responsible in this scenario. This is what most of the causal diagrams are based on.

"I can imagine that you make multiple drawings for multiple scenarios, where System Dynamics helps with scenario analysis." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

Next, the scenarios are presented which visualize interactor alignment, misalignments or conflicts. Six scenarios are identified (*see Table 21*). As indicated in the table, four of those scenarios concern dynamic interactions – interactions where the time dimension is essential – and two concern static interactions. The table also indicates which roles are involved in the interactions. The next sections elaborate on alignment, misalignments and conflicts between actors. The text is supported by quotes of interviewees. It should be noted that these scenarios do not represent all types of alignment and conflicts between actors that were identified. It thus does not give a comprehensive overview of all the key interactions between actors in the Ecosystem. The scenarios discussed represent the key forms of alignment, misalignments, and conflicts as perceived by industry experts (*see paragraph 4.3.2*) and ecosystem actors (*see paragraph 4.3.3*). The scenarios were selected based on the themes that recurred during the interviews. It should be noted that, because these scenarios result from the *perspective* the interviewees, they are not necessarily realistic. This is because, due to misconceptions, the *perceived* misalignments and conflicts between actors can vary considerably from the *actual* misalignments and conflicts. Therefore, the researcher attempted to shed light upon

the scenario from multiple perspectives and assessed if a conflict indicated by one interviewee is indeed supported by other interviewees. The below text is intended to make clear the advantages and disadvantages of the using causal diagrams for visualizing VIP-related alignment, misalignments and conflicts. These advantages and disadvantages are summarized in the conclusion at the end of the paragraph.

Table 21 – Scenarios.

Scenario number	Topic	Nature of interactions	Roles involved
1	Customer value	Dynamic	Insurance provider; security provider; customer
2	Consumers' willingness to share personal data	Dynamic	Insurance provider; security provider; customer
3	Security provider's response time and prioritization of action	Dynamic	Insurance provider; emergency services; security provider; customer
4	Effectiveness of the service	Dynamic	Platform & network provider; Insurance provider; customer
5	Incentives to establish the service	Static	Platform & network provider; insurance provider; security provider
6	Customers' flexibility of choice for sensor equipment	Static	Platform & network provider; consumers; hardware provider

Customer value

The causal diagram (*see Figure 25*) visualizes how the service generates value for consumers. In fact, it does not reflect one specific scenario but essentially visualizes where the value for consumers lies: in a reduced insurance premium and reduction of damage to their home and its contents because of the service. This is shown by the two arrows that affect the variable 'value for consumers to adopt the service'.

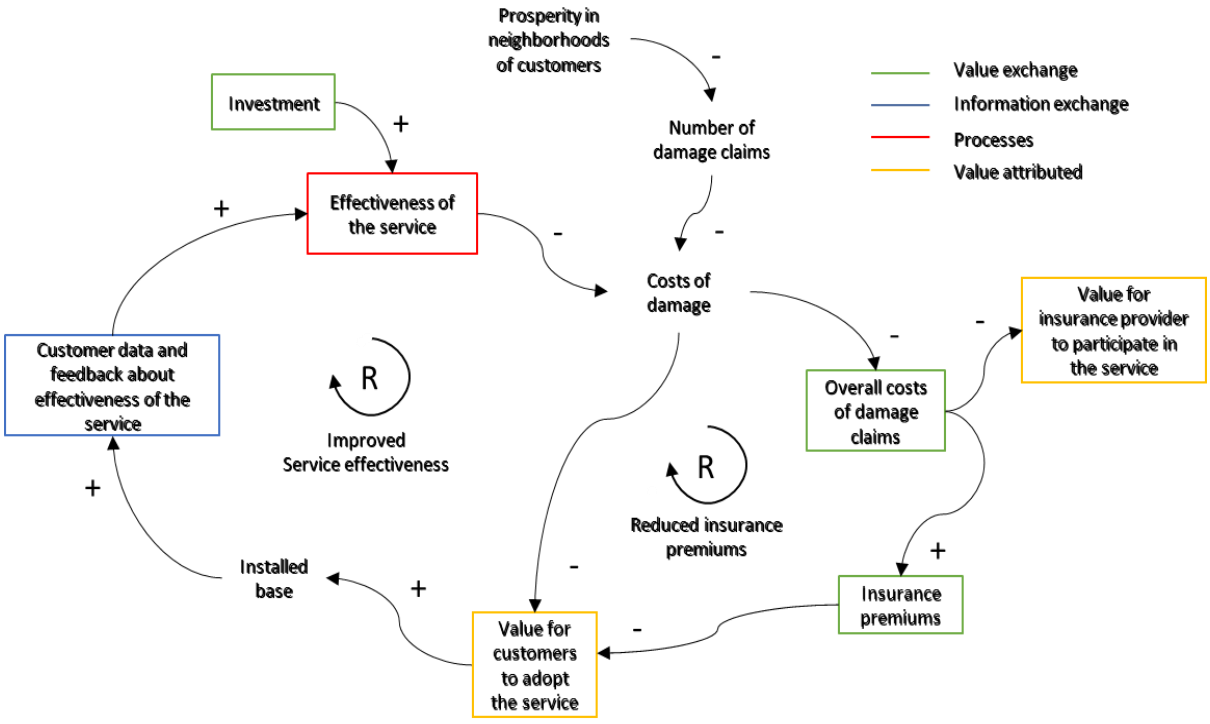

Figure 25 – Causal diagram for customer value.

Most variables are part of feedback loops and are therefore *dependent* and *endogenous* variables. An example of an independent and exogenous variable is 'prosperity in neighborhoods of customers'. This variable is elaborated on later. The diagram includes two reinforcing feedback loops that re-affect the value attributed to the service by customers. First, the growth of this value for potential customers increases causes an increase in the installed base. As the installed base increases, more customer data and feedback are generated. The more data is available, the more the service can be improved and become more effective. This effectiveness implies more adequate responses to notifications the devices generate, which consequentially leads to a reduction of damage to houses and house contents. This thus shows a negative relationship: the higher the service effectiveness, the lower the damage costs. This variable then re-affects the initial parameter: value attributed to the service by potential (and existing) consumers. Because this feedback loop has three positive, and two negative causal relationships, the eventual relationship between the parameters in the loop is positive. For that reason, this is a reinforcing feedback loop. This loop is named '*improved service effectiveness'.*

"The more customers share their data, the better the insights, the better the service and the greater the effectiveness." – Deal Execution Senior Manager at Accenture.

Second, reduction of damage to homes and their contents results in an overall reduction of the costs of damage claims. This has a positive relationship with the value for the insurance provider to participate in the service. As the costs of damage claims decrease, the insurance provider can reduce the home and home contents insurance premiums for consumers. This leads to higher value attributed to the service by consumers, as the premium costs are negatively related to this value. This second feedback loop is also positive and is called *'reduced insurance premiums'*.

A key variable in the causal diagram is the effectiveness of the service offering in reducing damage to the home and home contents. If this service is ineffective in reducing damage, or if the reduction of damage cannot be evaluated, the value attributed by customers and insurance providers is reduced significantly (interviewee G). The causal diagrams presented in the next sections prove that much misalignments between Ecosystem actors relate to this effectiveness of the service in reducing damage to homes and home contents. Conflicts or misalignments also arise if, although the service realizes a reduction of damage claims, the insurance provider is unwilling to reduce the insurance premium accordingly (interviewee L) (*see Figure 26*). This would reduce the value to consumers and, resultingly, also to the other Ecosystem actors that are involved in offering the service. The diagram offers the possibility for Ecosystem actors to see the causal relations and assess if it is indeed the case that there is a positive relationship between the overall costs of damage claims and the level of the insurance premiums. And, if so, up to what extent? The extent to which this relationship applies can only be assessed by quantifying the relationships between variables. For that, the term *elasticity* is relevant. Gaining insights in this elasticity allows Ecosystem actors to evaluate and form an opinion about the insurance provider's willingness to reduce the insurance premium based on the reduction in costs for damage claims they incur.

"One of the potential issues in this picture is: does this really lead to a lower insurance premium? Reduced damage claims cannot be passed on directly in the insurance premiums. If the insurance provider would do that, it would make little sense for them to cooperate because it provides them little net value. There must be a balance between the value that the insurance provider puts into this and takes out of this." – Deal Execution Senior Manager at Accenture.

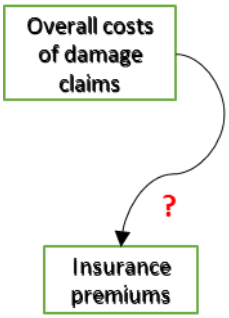

Figure 26 – Assessing uncertainties in causal relationships.

Another feature that relates to the elasticity is the relationship between the level of the insurance premiums and the value attributed to adopt the service (*see Figure 27*). Customers' gain in *monetary value* is not proportional to the gain in *value attributed.* For instance, the perceived value customers experience from a two Euro reduction of the insurance premium may be negligible, whereas a ten Euro reduction may not. This illustrates why the *value for consumers* is considered a separate variable in the causal diagrams, rather than directly reflected by the insurance premium in this instance. It is a scale that does not change in proportion to the change of, for instance, the change in monetary value. How exactly the change of monetary value relates to the change of perceived value can thus only be illustrated by quantifying, i.e. applying the entire SD cycle (interviewee C). After quantifying, conclusions can be drawn about how customers respond to the level of the insurance premium.

"The time dimension and quantification make it easier to tell something about the conditions under which certain business logic will fail or not." – Originator of the VIP framework and director of MBA at Nyenrode Business University.

"Maybe you can quantify it at some point. That would be the next step." – Deal Execution Senior Manager at Accenture.

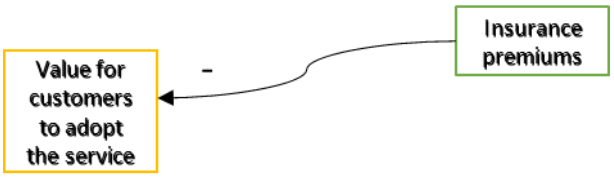

Figure 27 – Relationship between insurance premiums and value for customers to adopt the service.

Also, the *value attributed* to this reduction of insurance premiums for consumers differs per customer target group. Therefore, a distinction must be made between customer target groups. As argued by interviewee H, these target groups can be distinguished by income. The perceived value that customers gain from discount on insurance premiums as part of service is negatively proportional to their income. In other words, the value attributed to a reduction of insurance premiums is higher for lower-income groups than for higher income groups (interviewee H). In this scenario the causal diagram conveys an oversimplified picture of how the relationships between variables work. When differentiating across different customer target groups, the entire causal structure could change. As argued by interviewee H, high-income groups perceive a reduction of their insurance premiums as having little or no value. This implies that, for that customer target group, there is no positive relationship between the level of the insurance premium and the value attributed to the service (*see Figure 28*).

"It is possible to calculate how the reduction in insurance claims can be translated into a reduction of the insurance premium. You then arrive at a maximum of around ten euros discount per month. That is not a small amount, but it is also not what many people get out of bed for. It is mainly the low-income groups that really benefit." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

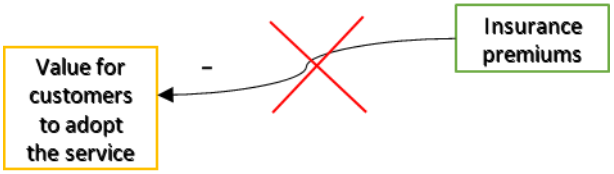

Figure 28 – No causal relationship for high-income customer target groups.

What should also be noted is that the relationship between 'customer data and feedback about the effectiveness of the service' and 'improvement of the effectiveness of the service' (*see Figure 29*) is not necessarily a *causal* relationship. The reason for this is that it includes the implicit decision of service providers to improve the service. Hence, although causal diagrams visualize how variables impact each other and thus how they change, they might fall short when it comes to comprehending the entire structure of Ecosystem dynamics.

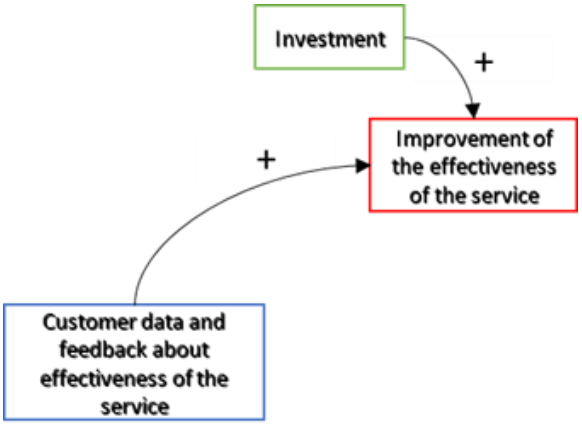

Figure 29 – Not necessarily a causal relationship.

A research that also explores other types of relationships is that of Nikayin (2014). Nikayin researched the drivers for collective action for the development of platforms for Smart Living services. In this PhD dissertation, not only causal relationships are visualized, but a wider range of relationships between characteristics. Examples of such relationships are: 'resource heterogeneity *fosters* innovation' and 'partners that complement each other *are required for* collective action. An example of a structure of such relationships is shown in the figure below (*see Figure 30*). A key difference between this approach and causal diagrams is that causal diagrams only consider variables, whereas this approach visualizes variables (e.g. *technical platform openness*, *competition between new and existing parties,* and *resource heterogeneity*) as well as other characteristics (e.g. *closed APIs*, *collective action*, and *immature technology*) (Nikayin, 2014). This approach may be more suitable for visualizing inherent decisions than causal diagrams. For the above example, this would imply that the relationship is as follows: 'customer data and feedback about the effectiveness of the service' *is required for* 'improvement of the effectiveness of the service'. Designating it as this type of relationship may be more appropriate than designating it as a *causal* relationship. To get a comprehensive picture of the relationships between variables, it is therefore worth considering if including other types of relationships generates a more comprehensive picture of Ecosystem relationships. It must however remain clear what the feedback loops are in the system, which are based purely on *causal* relationships between variables (interviewee C).

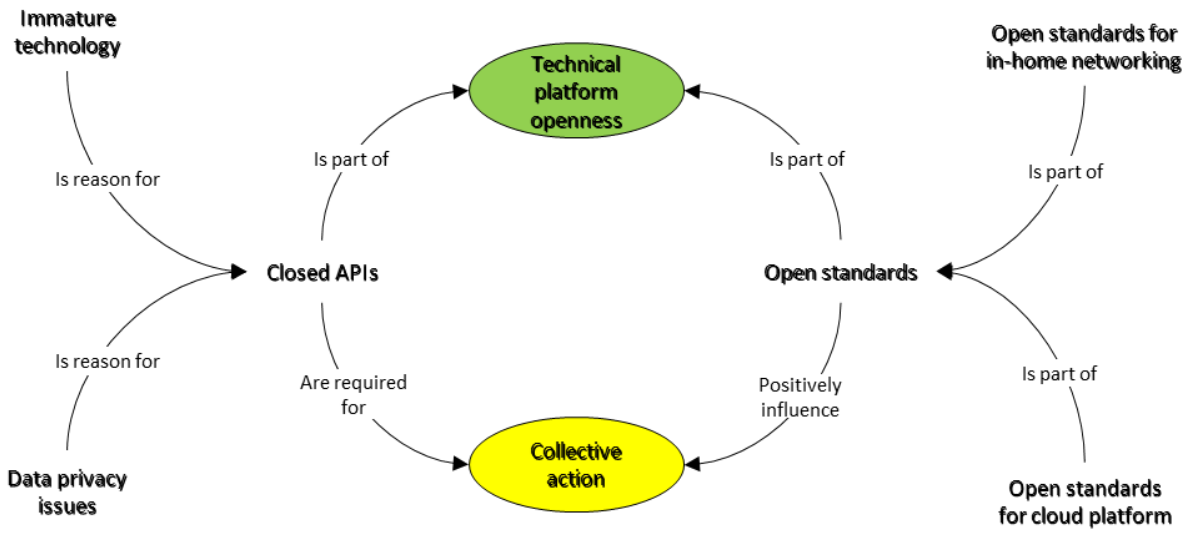

Figure 30 – Platform technical openness. Source: Nikayin (2014).

What should also be made explicit is the underlying unit of the variables (interviewee M). This prevents ambiguity. The below figure visualizes the causal relationship between 'costs of damage' and 'value for consumers to adopt the service' (*see Figure 31*). The unit of 'cost of damage' is Euros. The unit of 'value for customers to adopt the service' is more ambiguous, and should be clearly defined. An option for this is 'experience' (interviewee M), but it should still be defined how experience is measured. As argued by interviewee C, variables should always be measurable, and must be able to increase or decrease. Finally, Interviewee M argues it that the connotation of the minus symbol should be made clearer. This is however inherent in causal diagrams. By definition, the minus sign represents a negative causal relationship between the variables. In this context, an increase of the variable 'costs of damage' thus causes a decrease of the 'value for consumers to adopt the service'. Also, a decrease of the 'costs of damage' thus causes an increase of the 'value for consumers to adopt the service'.

"I see a positive causal relationship between value for customers to adopt the service and installed base. I then read that the value to the customers to adopt the service increases. What does the plus on the installed base do? The connotation of that plus must be clearer. The plus counts another unit: a customer that is added to the installed base due to the increase in value for customers to adopt the service. My suggestion would be to make a graph network of it and formally write down the transaction and the unit that is increasing or decreasing. You must prevent ambiguity. My suggestion would be to add a description for each arrow. In this case the cost of damage is in Euros. You then have to make the effect explicit: a lower value. You could express this in the unit experience." – Deal Execution Associate Director at Accenture.

"You must always be able to measure variables and variables must be able to increase or decrease. This way, you can explore which feedback loops are present." – *System Dynamics expert at Delft University of Technology.*

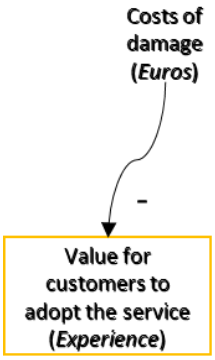

Figure 31 – Making the underlying units explicit.

Consumers' willingness to share personal data

Another potential issue is data ownership (interviewee F; interviewee G). The sensor data that is collected are officially owned by the customer. With regard to GDPR, customers have the right to request to revoke or delete data that can be traced back to them individually.

> *"Consumers are often aware of something going wrong. Then they also tend to say: I don't want to participate anymore; I no longer give the insurer permission to have insight into my data." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.*

Customer data is centralized on the platform administered by KPN, and customers must give their consent to KPN for sharing this data with third parties, such as the insurance provider. An essential question for the research case is thus: where does the data lie (interviewee F)? The customers' willingness to share their personal data with the insurance provider is a key variable that could lead to misalignment (*see Figure 32*).

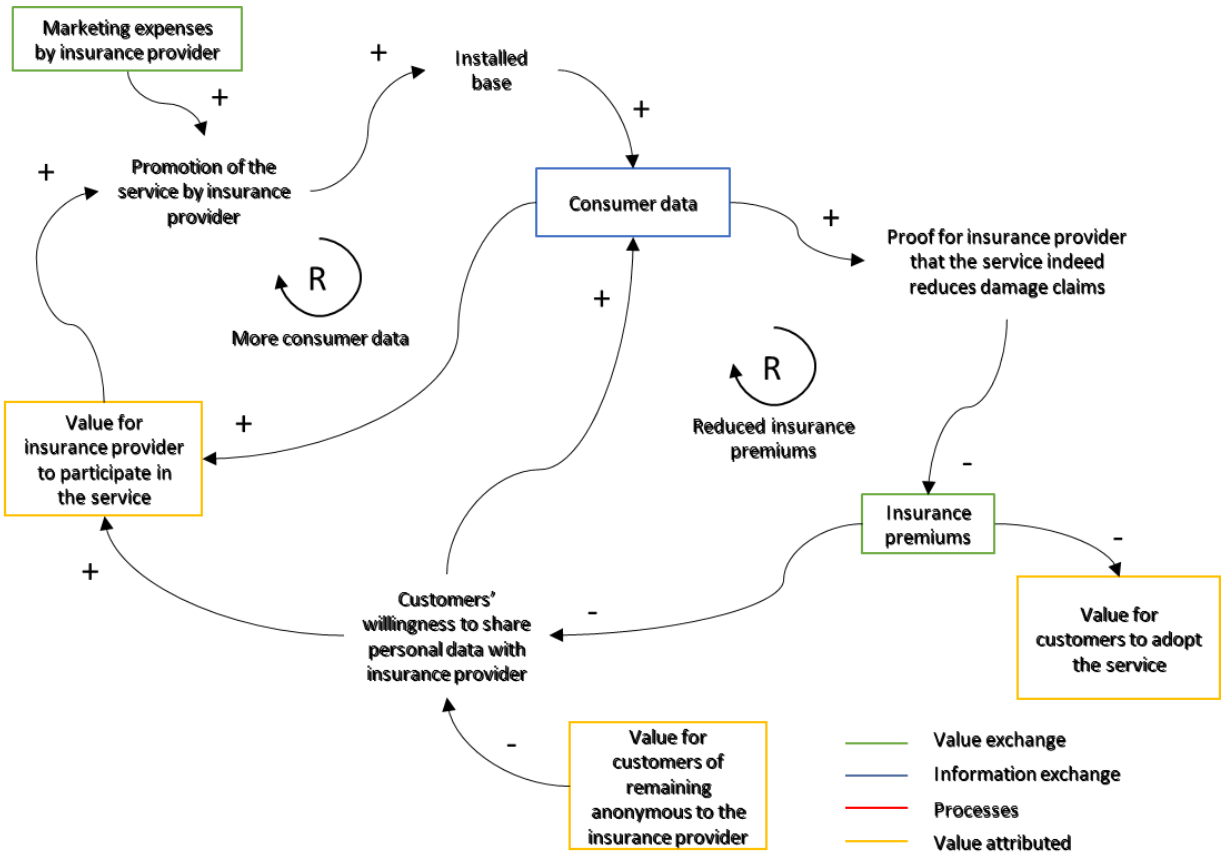

Figure 32 – Causal diagram for customers' willingness to share their personal data.

The higher the willingness of consumers to share this data, the higher value of participating in the service for insurance providers. As this value of the insurance provider increases, it is more likely to promote the service via its sales channels. This promotion positively affects the attraction of new customers. This generates an increased customer base, which then increases the available consumer data. This data has value to the insurance provider; hence the positive feedback loop of '*consumer data*'. The insurance provider highly values this customer data (interviewee G; interviewee H). With this data, they can confirm if the service does indeed reduce the damage claims submitted by customers. Up to a certain extent, the more certain the insurance provider is about this, the more discount they can offer their customers. This, in turn, improves both the value for consumers to adopt the service and their willingness to share their personal data with the insurance provider. This entire reinforcing feedback loop is called '*reduced insurance premiums*'.

"Running the service involves costs, and people must take out insurance which should actually be lower than the standard insurance. At the same time, the insurance provider has to ensure that cost reduction is indeed achieved due to the service." – Product Manager at BeNext Smart Home.

"If you have the indication that people have the willingness to share data, that's fine. On that basis, the value of the insurance provider indeed becomes higher and they can say: let's try this out. The 'willingness to share data' does drive 'the value for the insurance provider to participate in the service', so both are relevant." – Deal Execution Senior Manager at Accenture.

"A discussion was: what will you do with the data? We receive all kinds of data that is owned by the resident and not by Nationale Nederlanden or us. Then you have to coordinate well whether or not you can process that data and analyze it. Everything with data is always very interesting for insurance providers or similar parties." – Product Manager at BeNext Smart Home.

In issue may be that people are primarily inclined to purchase the service to improve their safety (interviewee H), and less so for a reduction of their insurance premiums. Consumers will not share their data if the value for customers of remaining anonymous to the insurance provider is higher than the value attributed to the discount for their insurance premiums. This leads to a balance: consumers either prefer to stay anonymous to the insurance provider or prefer to get an insurance premium discount. The balance between these two variables is not visualized in the causal diagram, because there is no *causal* relationship. However, in terms of apprehending the relationships between variables, it may be relevant to visualize this relationship as it reveals the underlying structure and conveys to Ecosystem actors that a balance is struck between the variables (*see Figure 33*). In line with the research of Nikayin (2014), this again shows the potential relevance of visualizing other types of relationships between variables or characteristics rather than just *causal* relationships.

"We were occupied with home content insurance policies for individuals. That is a difficult case as it was about euros per month. That is not what people do it for primarily. They do it for safety." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"If you pay 20-30 euros per month for an insurance, and offer a 10% discount, I think you cannot make the trade-off of investment for the service versus the monthly benefit. With a burglary it is never about the money. It's always about the emotion." – Strategic innovator at NN Sparklab.

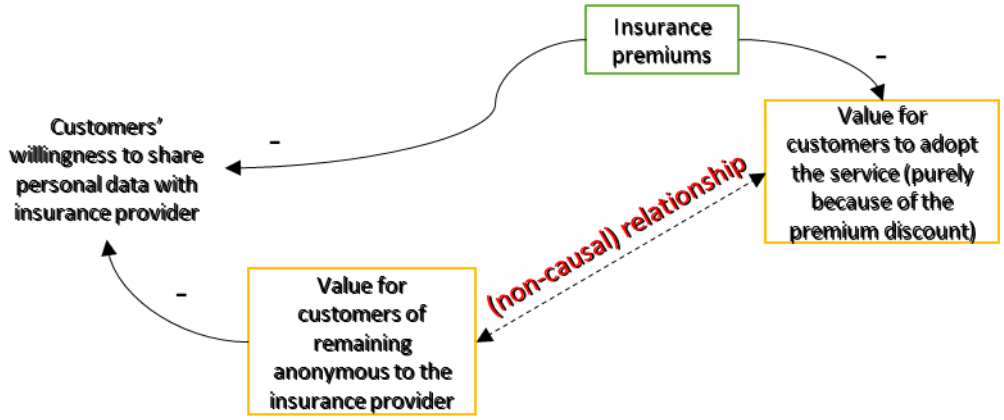

Figure 33 – Balance between value for consumers to remain anonymous or to get an insurance premium discount.

To nuance, there are however other structures where consumers do not have to share their data directly with the insurance provider and the insurance provider is still have evidence based on which they can justify the insurance premium discounts (interviewee K). This nuance results from the difference in perspectives between the interviewees.

"Naturally, we want to evaluate the decrease of damage due to the service. If the assumption is: customers have less damage, then you want proof. This does not necessarily have to be in the form of direct customer data." – Strategic innovator at NN Sparklab.

"We and the partners are interested in data. You use the data in the platform, but you do not use personal data. What you do is aggregate data to a level at which it can no longer be traced back to individuals, and improve your services from there." – Project Manager SecuritasHome and Business Developer at Securitas.

Next, the evolutionary phases of Ecosystems should be considered (Interviewee M). Data generated by the service can be reused to generate new types of services. This is often the long-term goal that commits Ecosystem partners to set up such a service. As suggested by Interviewee M, different phases of causal diagrams can be distinguished. The service corresponding to the research case generates a causal diagram of timestamp t=0. However, for instance the consumer data that is generated using movement sensors can be used to compose behavioral patterns of residents. These patterns can subsequently be used to generate an alarm in case an (elderly) person does not appear in a bathroom for a longer period of time (interviewee I; Interviewee M). This new service, which relates to the healthcare domain of Smart Living, can be used to expand the initial service; and the corresponding causal diagram receives a timestamp t=1 (*see Figure 34*). This generates a new reinforcing feedback loop called 'installed base for additional service', which creates new value. This could even mean that the purpose of the initial service is purely to collect data to define these user patterns. This implies that the underlying BM of the current service (t=0) is not necessarily viable. It could be that only the future BM (t=1) is designed to be viable (interviewee M).

"As a comment on the approach, I would like to say that it should be approached from the evolution of an ecosystem; and how that will expand in the future. You can look at it in a very practical way: I do indeed offer an insurance and security service, and that in itself should cover costs. However, the only reason for that network to exist is the future value I can get from the data I collect, and the potential that that data has to redesign a product or service to the next level. So I reuse the data, and thereby create a future revenue stream. What you will see is that certain feedback loops will develop: (i) the existing feedback loops can be reinforced and (ii) new ones can emerge. The evolution that finds place brings the real value. What you could do to illustrate this is starting at t = 0, and then show at t = 1 what the new types of products are in the Ecoystem." – Deal Execution Associate Director at Accenture.

"Think of the value creation of a new feedback loop: can I use my sensor data to create a behavioral model (real time) of a resident? That could be a form of elderly care. I place my water sensors in my bathroom or washing room. If I add a motion sensor, I can make a behavioral map. If someone does not appear in the bathroom for a longer period of time, I can alert my people to come and take a look; in a non-intrusive way." – Deal Execution Associate Director at Accenture.

"My house is protected against burglary, but the home is not my primary concern with grandma. In the same system, I want to use the same sensor that is triggered during a burglary, but works the other way around for grandma: I want to know if grandma is not moving. What you don't want is fragmented solutions: purely for burglary, lifestyle monitoring, or other purposes." – Business Director of the Alarm Service Center at Trigion.

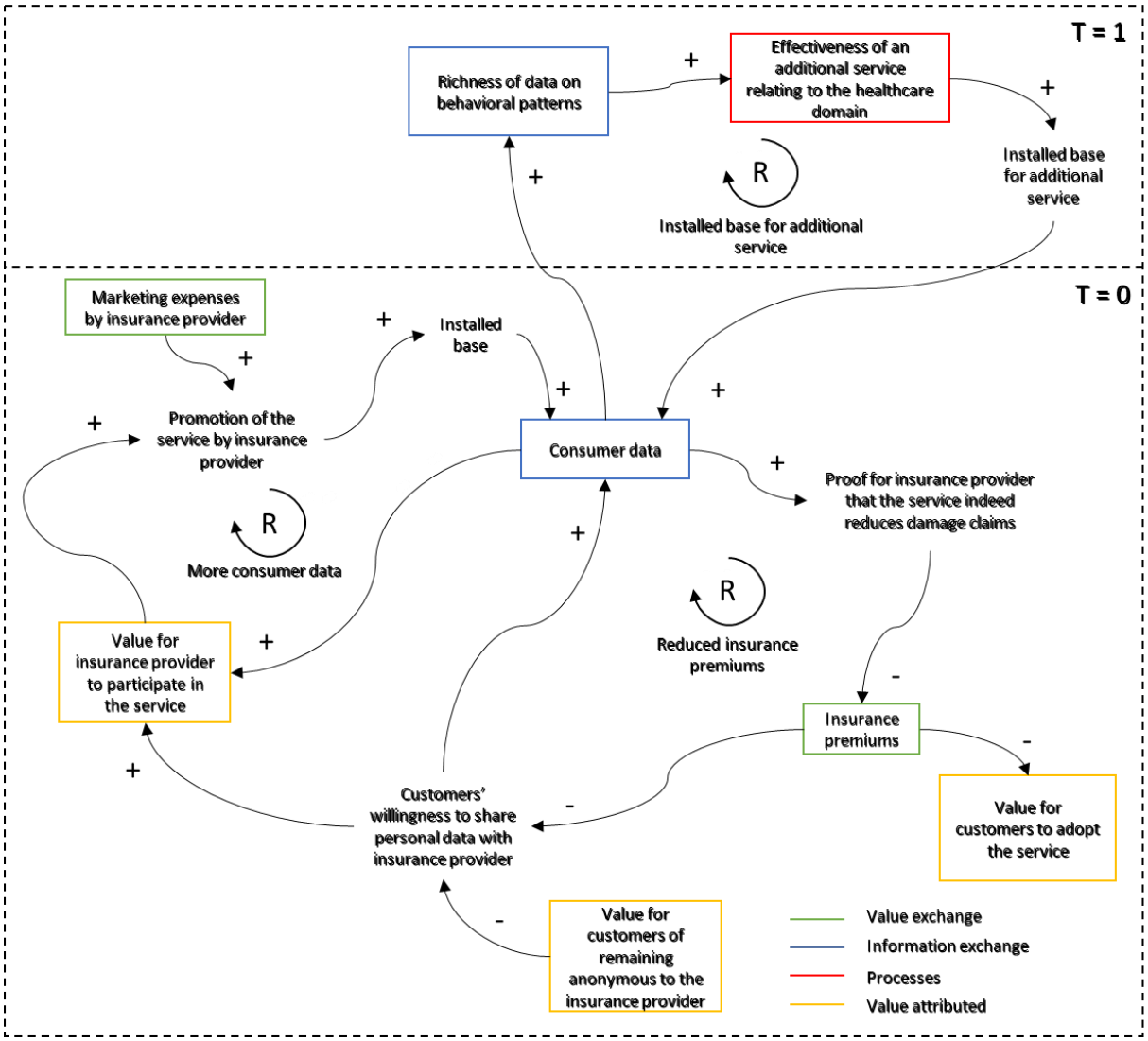

Figure 34 – Evolution of the Ecosystem.

Security provider's response time and prioritization of action

The effectiveness of the service in reducing damage, as was discussed in the previous two sections, is largely dependent upon the lead time of security providers' time to respond to notifications generated by the IoT device. This scenario touches both upon this lead time and the centrality of notifications at the security provider (*see Figure 35*). The bottom line of the scenario is that there is a perceived conflict, which arises from differing strategic objectives. The insurance provider may have the objective of minimizing damage and thus minimizing damage claims, whereas the security

provider may prioritize to first send a security guard to the house, since this is a key source of revenue (interviewee G; interviewee H).

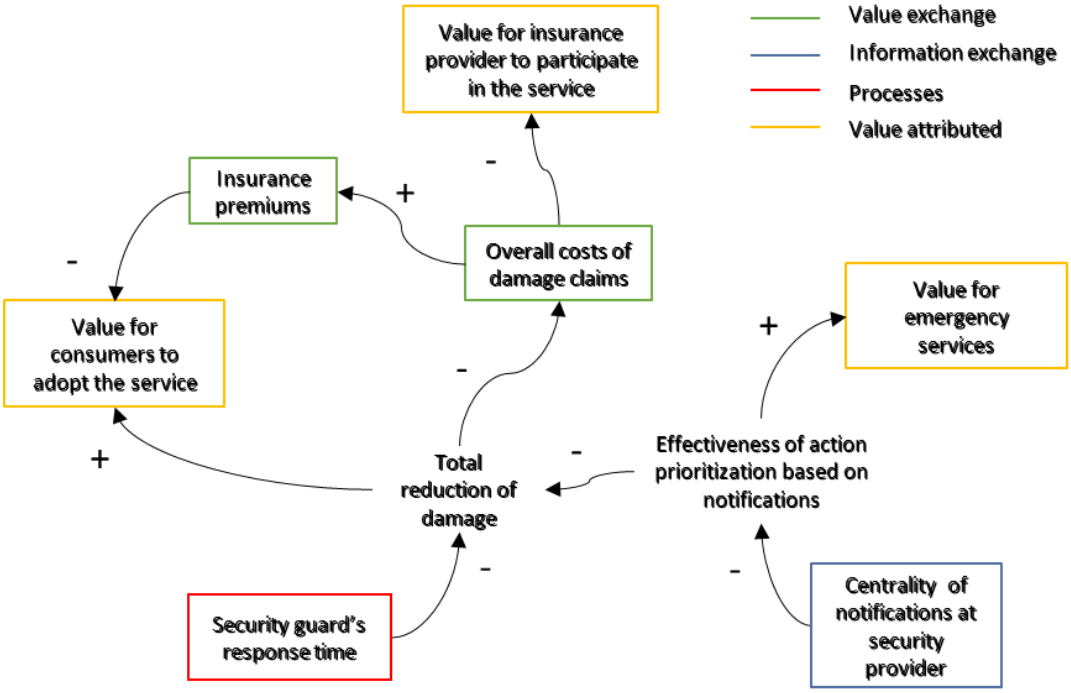

Figure 35 – Causal diagram for security provider's response time and prioritization of action.

This potential strategic conflict could lead to ineffective decision making. With the service offering, the notification data is centralized at the security provider which, consequently, decides whether or not to request assistance from emergency services. A concern from the perspective of the insurance provider, emergency services, and consumers is whether the security provider effectively prioritizes the action to be taken based on these notifications. As mentioned by Interviewees G and H, centralizing this data with the security provider reduces transparency and raises questions regarding the proclivity towards deploying a security guard, rather than emergency services. In this scenario, emergency services become dependent upon the security provider for responding to notifications, while preferring to remain autonomous in prioritizing action in a big data context (interviewee H). This negatively affects the value for emergency services, because it leads to a reduced adequateness of responses to notifications. A concern that is closely related is a security guards' lead time for responding to notifications (interviewee G). Average response time is a *processes-related* metric included in Heikkilä et al. (2015). From the perspective of customers and the insurance provider, the security provider may take too long to respond to the notifications; particularly when comparing it to the response time of emergency services (interviewee H). Security guards have no dispensation to exceed the maximum allowed speed and, in case of a notification of a fire, there is not much that the security provider can do. This scenario does not lead to a minimization of damage to homes or home contents; which is the strategic objective of the insurance provider. If this results in a mere marginal reduction of the damage claims for home or home contents insurance, the insurance provider will have less interest in participation in the service. Finally, the decreased effectiveness of the service in reducing damage and the consequential absence of a reduced home and home contents insurance premiums lead to a decrease of the value attributed by consumers as well.

"Police now only respond to emergency call (112) reports. They prioritize this based on the number of people who have called. If one old woman sees something suspicious, this weighs less heavily than when ten people call. This data is interesting. The combination of, for example, data about a telephone call, an alarm, and activity in a WhatsApp group in the neighborhood is relevant for giving priority to reports. In your case this is actually centralized and fully in the hands of the security

provider. They can prioritize based on this, but of course have a commercial interest themselves. The more often they are deployed, the better it is for their business case." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"A Security provider would benefit more from sending a security guard over than immediately calling in emergency services, while an insurer wants to minimize damage costs" – Product Manager at BeNext Smart Home.

"I have never understood the value of security providers responding to connected notifications. It takes a long time before they arrive. If it is serious then they call the fire department themselves." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

This paragraph shows that the conflicts in the above scenario arise from *perspectives* of interviewees – hence also the perspectives of Ecosystem actors – which are not necessarily realistic. Interviewee I and J do not agree with the claim that the strategic objective of security providers is to send security guards. They perceive a security guard as a last resort, and argue that this happens only occasionally. Additionally, interviewee I states that emergency services *require* security providers to be the intermediate layer, because this filters out false notifications and makes the action prioritization *more* instead of *less* effective. This thus results in a *positive* rather than a *negative* relationship between the centrality of notifications at the security provider (*see Figure 36*).

"I do not agree with the statement that our business case is reinforced by sending a security guard as often as possible. A security guard is a kind of last resort. If I know for sure what is going on, I will send the police straightaway. The security guard has no added value at all." – Business Director of the Alarm Service Center at Trigion.

"I don't see any strategic conflicts between us and an insurer. I don't recognize the conflict of insurers pursuing damage prevention and the security party pursuing to send out security guards." – Project Manager SecuritasHome and Business Developer at Securitas.

"Of the 450,000 reports that we mention per day, approximately 150 lead to deployment of security guards. Of the 150, the vast majority is the conscious choice of the client to send a security guard. Then maybe ten notifications a day are left of which we say: we don't know for sure, but it doesn't feel right. That's the ratio." – Business Director of the Alarm Service Center at Trigion.

"Police, fire brigade and medical services almost require us to be the intermediate layer. As a first responder for real problems, you want to get as few false reports as possible. If I forwarded all my reports to the police, they would not be pleased. Also, they do not have the information position to run the if / then analyses themselves." – Business Director of the Alarm Service Center at Trigion.

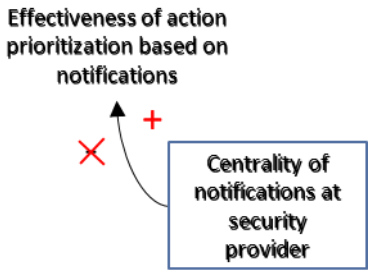

Figure 36 – Not a negative but positive relationship between centrality of notifications and effectiveness of action prioritization.

Conclusive, the perception of causal structures can differ per actor. Therefore, especially in the beginning of forming the partnerships, causal diagrams can be used to let Ecosystem actors assess if the causal relationships are indeed valid (interviewee L).

"You have conversations with everyone and with this approach you immediately have a way to record it. That is nice and easier than having to write it down in text. In addition, it offers the opportunity to think further and further delve into it. It does not have to be correct and complete the first time. That doesn't matter, because you further delve into it step by step." – Deal Execution Senior Manager at Accenture.

Effectiveness of the service

The service must first be tested in a pilot phase before it can be offered to the market. A key issue during this pilot phase is that it includes a limited number of residences, and often no alarms are triggered during this relatively short period of time (interviewee G). This makes the estimates of the effectiveness of the service in reducing damage less reliable. As visualized in the causal diagram (*see Figure 37*), it is hard to evaluate the effectiveness of the service offering beforehand. This however reduces the perceived value and willingness to participate of the insurance provider, emergency services, and platform and network provider. These false notifications were also a major hurdle at the start of the Achmea Homies project (interviewee H). If the security provider receives these false alarm notifications, and requests assistance from emergency services, the emergency services' capacity would be wasted. Also, the value of the service for consumers decreases rapidly as it turns out to generate false notifications frequently (interviewee H). Moreover, as they pay for the security provider's services on a per-use basis, it is conceivable that they would be unwilling to pay this fee if it is the result of a false alarm notification.

"The service had never been fully tested. It had been around for six months and they tested it themselves, but within that period there had been no real fire alarm or burglary. That is of course the tricky thing about pilots. You actually do not want it to happen, but if it does, you want it to happen well. The fire department also has a stake in it; they don't want to be sent to the same house every week for a false report. It must be properly managed so that not too many false reports come in." – Product Manager at BeNext Smart Home.

"False notifications have also been a major problem at the start with Achmea Homies. With false notifications the value of the proposition to consumers decreases rapidly. People lose confidence very quickly." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"You always have uncertainties in a partnership. One of these is whether the service actually leads to damage reduction. If there is a certainty, it is easy to get into it. You have to dare to take risks. If it is tested in a controlled environment, where learning is more important than scaling, it is simply one of the uncertainties that you consider." – Strategic innovator at NN Sparklab.

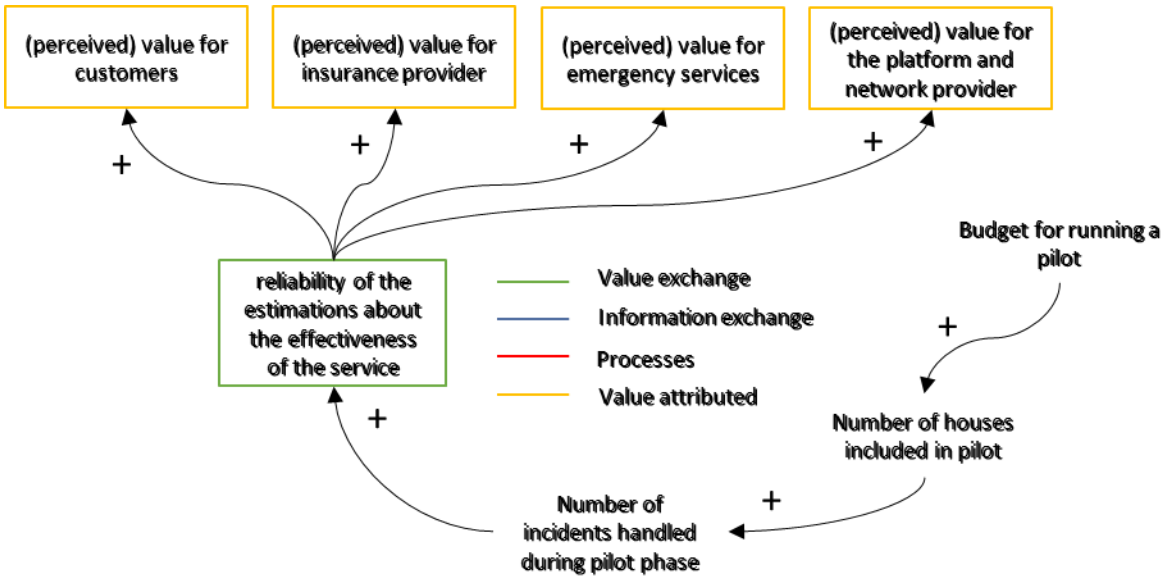

Figure 37 – Causal diagram for reliability of the service.

What remains undiscussed is the following salience. In this diagram, the variable '*reliability of the estimations about the effectiveness of the service'* is categorized as a *value exchange.* This is because the better actors can estimate if the service is indeed effective, the better informed they are. Based on this information, they can decide whether or not to participate in the service. This thus offers *intangible value* for Ecosystem actors. However, this is not a value offered by one actor specifically. Higher reliability is a value for which the Ecosystem actors are on the *receiving end*, but the *providing end* is the service in general. This constitutes two categories of VIP-related variables: some of these variables reflect bilateral relationships (e.g. the insurance premium), whereas others reflect generic dynamics that occur in the Ecosystem. Both categories of variables are included in Heikkilä et al. (2015). For the variables that reflect bilateral relationships, the corresponding actors are clear. For instance, the variable '*insurance premium'* is a tangible value exchange (cash flow) between the customer and the insurance provider, as can also be seen in the VIP interactions and interdependencies diagram (*see Figure 24 in paragraph 5.2.2*). The variable '*reliability of the estimations about the effectiveness of the service'*, does not reflect a bilateral relationship between actors. This distinction is relevant because of the following reason. Based on the conflicts and misalignments visualized by the causal diagrams, action can be taken. This action should bring change to the causal structures. It is essential to know to which Ecosystem actors the key variables (that lead to conflicts or misalignments) relate, because often these actors can realize the change to eliminate these conflicts or misalignments.

Incentives to establish the service

This causal diagram (*see Figure 38*) relates to trust between all actors (*see paragraph 5.1.6*) that is driven by their common strategic objectives. As argued by interviewee H, there are two main strategic objectives that align partners to establish a Smart Living service such as that of the research case. These are: (i) trust among actors that cooperation leads to an increased accumulated value and (ii) fear among actors that a new entrant will acts as a dominator and draw all value towards itself. By extension, interviewee J argues that another incentive that commits partners to cooperate is the long-term vision. A bundled service leads to consumer lock-in, which increases consumer lifetime value. These features commit the Ecosystem actors to cooperate and enhances the mutual trust. As argued by Heikkilä et al. (2015), this *commitment of partners* and *trust between actors* are categorized as value exchanges. Finally, another perspective on the long-term vision is given by Interviewee M. As shown in *Figure 34*, the common vision of Ecosystem evolution is what commits partners and improves their mutual trust (interviewee M). The reuse of collected data can generate

new reinforcing feedback loops, which creates new value for the actors. It should be noted that perhaps more incentives can be thought of. One of those incentives, for instance, is access to new sales channels. This was already discussed in the Partner Value Matrix (*see paragraph 5.2.1*) but was not mentioned by interviewees as contributory to a higher commitment and mutual trust between actors.

"I hear you talking about value exchanges between actors. What I see is that the point is that there is trust among all participants that cooperation leads to an 'increased size of the cake. Participants value this, even though they do not yet know upfront what piece of the cake they will get." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"A second motivation that I see is the fear that if parties do not cooperate, there will be a large (American) platform that will draw all the value in the Ecosystem towards itself. That would be a winner-takes-all party. The fear of this ensures that all parties are dedicated to keeping such parties out." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"In my view, the long-term vision would be an important argument for cooperation between parties. You should think of current consumer lifetime value. These are currently relatively short, especially with a telecom operator. If you can extend this by bundling different products, you create stickiness with the customer. If the customer has an alarm system that is bundled with telecom services and insurance, he or she does not leave that easily anymore." – Project Manager SecuritasHome and Business Developer at Securitas.

Think of the value creation of a new feedback loop: can I use my sensor data to create a behavioral model (real time) of a resident?" – Deal Execution Associate Director at Accenture.

As mentioned in the beginning of the paragraph, this causal diagram reflects a static perspective. This implies that the time dimension is not of the essence. Even without this time dimension though, causal diagrams can visualize the structures of alignment, misalignments or conflicts between partners. In this case, it relates to alignment: the incentives lead to a higher commitment and mutual trust between actors. The causal diagrams also allow the Ecosystem actors to asses if these incentives are indeed present. For instance, interviewee J was presented these causal structures. He then concluded that he does not agree that the fear among actors that a new entrant will acts as a dominator and draw all value towards itself is an incentive to enhance actor commitment to cooperate and trust between actors.

"I think the idea of building a partnership to shield off a large (American) conglomerate is naïve; because it will happen anyway." – Project Manager SecuritasHome and Business Developer at Securitas.

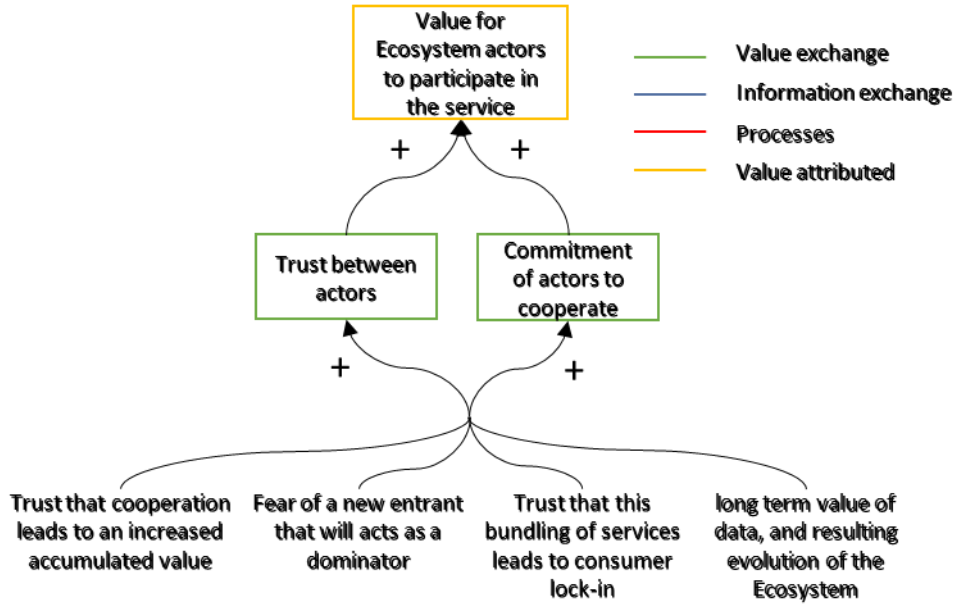

Figure 38 – Incentives to establish the service.

Customers' flexibility of choice for sensor equipment

Interviewees were aligned on the next topic. They argued that the sensor equipment should not be part of the service offering (interviewee H; interviewee I; interviewee J). Consumers may already own Smart Living appliances or prefer to buy certain appliances themselves. The number of alternative suppliers is a processes-related variable introduced in Heikkilä et al. (2015). This number thus affects the value attributed to the service by consumers. This is visualized in an elementary causal diagram (*see Figure 39*). Because the causal structures are not complex here, there is no major added value in using causal diagrams. The interviewees, however, were aligned on which activity can be thought of as a solution for this current misalignment. This activity, and other activities to eliminate interactor conflicts and misalignments, are presented in the next paragraph.

"I think it is a mistake that the insurer must buy and resell the equipment. That equipment does not need to be part of the service offering by insurance providers; consumers can choose the equipment for themselves. The insurer should think about which proposition / platform they want to build around it. Interpolis insures approximately half the Netherlands. It makes no sense to focus on people who happen to have a Toon thermostat. The many-to-many thought in such an ecosystem has disappeared." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"I support the idea to be able to connect different devices via an open API, leaving the choice of hardware to customers. That is a world that goes beyond us. You can try to shield that with a Chinese wall, but then you will have a disadvantaged position I think. Also, I do not believe that the revenue model is in the supply of hardware. On the other hand, I think an open API is tricky. IoT is insecure by design. That is not something you want to convey. As a supplier I would therefore prefer to deliver a product to the customer: the central unit. This unit must be intelligent and able to communicate with devices by communication protocols (Zigbee, Z-wave)." – Business Director of the Alarm Service Center at Trigion.

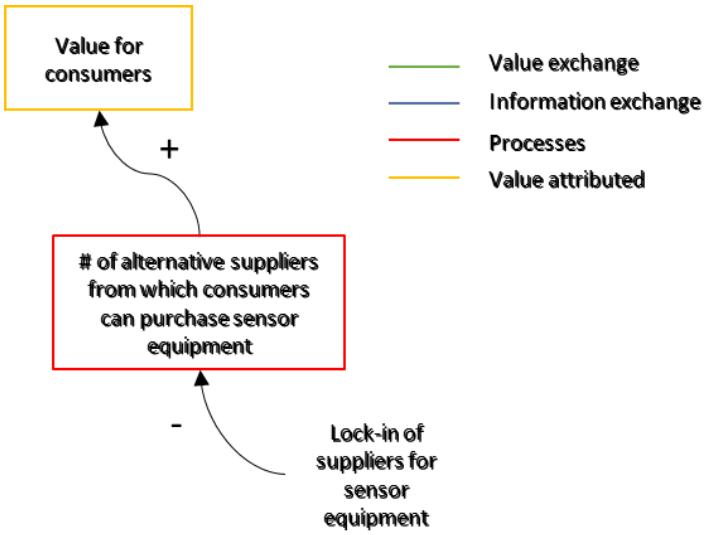

Figure 39 – Customers' flexibility of choice for sensor equipment.

Conclusions

As concluded from the interviews for validation, the causal diagrams are logical, and, from a practical perspective, there is value in drafting them (interviewee L). Based on what is discussed in this paragraph, this section provides conclusions regarding the integration of the VIP framework and SD approach. These conclusions include both advantages and disadvantages, which are summarized in the table below (*see Table 22*).

"In my opinion, these causal structures are logical; I think that they're correct." – Deal Execution Senior Manager at Accenture.

"In the end, I think there is value in this type of visualization in practice; especially to get the conversation between all parties going. For the design of the process and looking at whether there really is value in establishing this service, it can help. But also to record it: the structures can be documented in this way. At the moment we do not go much further than yellow notes. I think this approach requires a lot of work, but it has value." – Deal Execution Senior Manager at Accenture.

"In practice, we have not yet reached the point where we can map out these types of structures and incentives. We didn't get much further than a picture similar to the VIP interactions and dependencies diagram. These types of causal diagrams we only had in our minds." – Deal Execution Senior Manager at Accenture.

Table 22 – Advantages and disadvantages of the integration of the VIP framework and SD approach.

Advantages	Disadvantages
As discussed earlier (*see paragraph 2.4.2*) humans are likely to misinterpret how systems with dynamic relations behave (Simon, 1957). SD helps overcome bounded rationality by visualizing these causal structures (Abdelkafi & Täuscher, 2015). SD thus helps understand causal relationships between VIP-related variables, allowing for scenario analysis and better-informed decision making. This decision-making is done by identifying (*see paragraph 5.2.4*) and sequencing activities with which the causal structures can be adapted, and the underlying BM improved	Causal diagrams only visualize causal relationships and no other types of relationships between variables. Visualizing only causal relationships does thus not result in a comprehensive picture of the relationships between variables in the Ecosystem
Causal diagrams are useful to get the conversation between all parties going. The diagrams are useful for the design of the process and looking at whether there really is value in establishing this service	Lack of quantification means that nothing can be said about the *elasticity* and *strength* of the causal relationships
Since causal diagrams visualize continued increase or decrease of variables by reinforcing or balancing feedback loops, they show how *value* in the Ecosystem builds up over time	The causal structures are set up using abductive reasoning. Since abductive reasoning can be regarded as inference to the best explanation, the conclusions that follow from this cannot be verified. These conclusions thus have a degree of uncertainty to them, making this type of reasoning weaker than deductive reasoning
Causal diagrams provide a means to *record* key Ecosystem dynamics, allowing actors to discuss the truthlikeness of the scenarios considered. They can come to an agreement in these discussions and, step by step, delve further into the causal structures	The introduction of the fourth component, *value attributed*, blurs the boundaries between the phases *of exploring* and *exploiting* business ideas. It allows actors to explore where the value they attribute lies, and how it builds up. The starting point of VIP framework, however, is that the underlying BM is already defined, which implies that the actors should already be past this phase of exploring
The introduction of the fourth component, *value attributed*, allows actors to identify where the value they attribute to certain dynamics lies, and how this value is impacted as a result of changes in other variables	The process of establishing the causal diagrams is time-consuming
The approach allows for the exploration of future services, and corresponding feedback loops. This is because the data generated by the initial service can be re-used to create new services. Consequently, (i) existing feedback loops can be reinforced and (ii) new ones can emerge. This can be illustrated by including future (t=1, t=2, etc.) situations in the current (t=0) causal diagram	
Causal diagrams can be used visualize dynamic, but also static (i.e. non-time-related) dependencies and interactions between actors	

5.2.4. Activities

The interviewees suggested several activities to eliminate interactor conflicts and misalignments. These are presented in the below table (*see Table 23*). These activities relate to the six scenarios that were presented in the previous paragraph. Four of the suggested activities are presented in the upcoming sections.

Table 23 – Activities.

Scenario number	Topic	Activity number	Activity	Explanation
1	Customer value	-	-	No misalignment or conflict was presented in the causal diagram, so no activities are required
2	Consumers' willingness to share personal data	**1**	Incentivize data sharing by variable insurance premiums	
3	Security provider's response time and prioritization of action	**2**	Establish an all-in security contract	
4	Effectiveness of the service	**3**	Simulate scenarios in trial phase	
5	Incentives to establish the service	-	-	No misalignment or conflict was presented in the causal diagram, so no activities are required
6	Customers' flexibility of choice for sensor equipment	**4**	Exclude sensor equipment from service offering	

Incentivize data sharing by variable insurance premiums

As argued by interviewee H, the value of data for insurance providers is with very simple types of data, such as: whether their smoke detector is still functioning properly. This data does not lead to a massive invasion of their privacy. A way to incentivize consumers to start or keep sharing their data is linking the level of the insurance premium to the extent to which they are willing to share data with the insurance provider. If they prefer to remain anonymous and not share their data, they do not receive any insurance premium discounts. On the other hand, the more personal data they are willing to share, the more insurance premium discount they receive. An example of such an incentive is to link the downtime of a smoke detector to the insurance premium: the longer it is unconnected, the higher the insurance premium. This presents a balancing feedback loop, which is called '*incentive to share data*' (*see Figure 40*). In this case, it incentivizes consumers to replace the batteries of their smoke detector, so that (i) the insurance provider knows that it is turned on again, and (ii) the consumer and the consumer's home and home contents are better secured. This activity is categorized as one of the strategies to improve BM robustness by Abdelkafi & Täuscher (2015): *introducing a balancing feedback loop to improve the tolerance to unpredicted dynamics* (*see paragraph 2.4.2*).

"Everyone is talking about advanced data; such as data about when someone is home. Around the concept of smoke detectors, one of the most important discriminatory factors for damage is whether you have a smoke detector or not, and if it works. The next step of connecting the smoke detector is actually very small." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"Nowadays, knowing whether the smoke detector works is fairly easy. Just having those data points is relevant. If someone doesn't replace their battery, you can send them a message: we see that it takes too long to replace the battery, so your insurance premium goes up by a few euros a month. You give them a fine. That motivates people to turn it back on quickly." – Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY.

"I recognize this (see Figure 40). You want to improve customer behavior." – Deal Execution Senior Manager at Accenture.

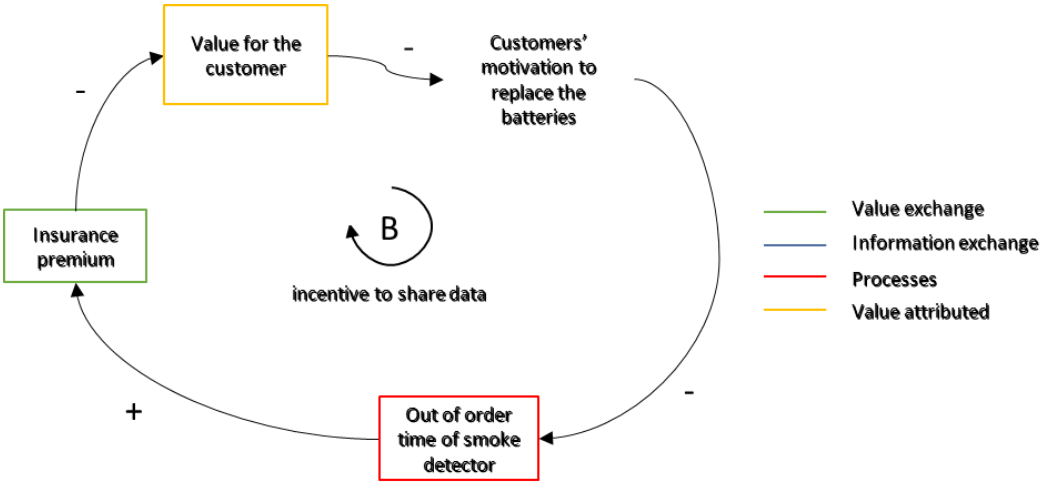

Figure 40 – Balancing feedback loop for incentive to turn on the smoke detector.

Establish an all-in contract with the security provider

In the previous paragraph, it was described how some interviewees recognized strategic conflicts between the insurance provider and security provider (interviewee G; interviewee H), whereas others did not (interviewee I; interviewee J). Regardless of whether there indeed is such a strategic conflict, an activity to remove the *concerns* of strategic conflicts between the insurance provider and security provider is the following. If the service offering includes an all-in contract where the costs for the services offered by the security provider are not paid on a per-use basis but on a subscription basis, the security provider does not benefit from sending security guards over requesting assistance from emergency services

"With SecuritasHome you do not pay extra for every time a security guard is sent. As a result, we are somewhat more expensive in the monthly fee, because you must be able to offset the costs that you incur for this. Also, I do not believe that you should do this in a different way in the context of partnerships." – Project Manager SecuritasHome and Business Developer at Securitas.

"Looking at our contract forms, we much prefer to create an all-in contract. The customer takes a system linked to a control room, which costs an x amount." – Business Director of the Alarm Service Center at Trigion.

Simulate scenarios in trial phase

As argued in the previous paragraph, it is hard to evaluate the effectiveness of the service offering in advance. The pilot phase includes a limited number of houses, and often no alarms are triggered during this relatively short period of time. This makes the estimates of the effectiveness of the service in reducing damage less reliable. An activity to eliminate this issue is to simulate scenarios of fire or burglary in real-life experiments and evaluate if the service properly generates alarm notifications and if the security provider acts adequately based on this input (interviewee G).

"We did share data once, but I think that concerned how often a smoke alarm had gone off. That of course never happens in a pilot, so that had to be tested. Has the alarm notification subsequently been sent to the security provider (Securitas) properly? How did they process this?" – Product Manager at BeNext Smart Home.

Exclude sensor equipment from the service offering

Various interviewees (interviewee H; interviewee I; interviewee J) argued that the sensor equipment should not be part of the service offering, as it limits the choice for consumers to buy equipment for themselves. An activity presented is therefore to exclude this sensor equipment from the service offering and set up a whitelist that includes all the types of equipment in the market that is supported by the central unit and platform. As argued by Abdelkafi & Täuscher (2015), a strategy to improve BM robustness is to reduce path dependence by making the BM more adaptive (*see paragraph 2.4.2*). That is what is realized by implementing this activity. A salient detail is that in the paragraph (*see paragraph 2.4.2*) an example of hardware provider lock-in was already mentioned. This scenario is comparable to the scenario to which this activity responds.

"In a whitelist you can say: these devices I support functionally. This leaves the choice for hardware with the customer." – Business Director of the Alarm Service Center at Trigion.

"We also think it is important that the functioning of the system and platform can be guaranteed. From that perspective, we work with a domotics whitelist. The consumer can also order the hardware somewhere else" – Project Manager SecuritasHome and Business Developer at Securitas.

6. | Conclusion and discussion

This chapter draws conclusions from the research (*see paragraph 6.1*). Also, academic contributions are discussed by referring to the knowledge gaps introduced in the first chapter (*see paragraph 6.2*). The practical contributions are discussed from the perspective of both Accenture and KPN (*see paragraph 6.3*). Finally, the research limitations (*see paragraph 6.4*) and recommendations for future research initiatives (*see paragraph 6.5*) are given.

6.1. Conclusion

Based on the knowledge gaps in academic literature, the researcher explored how a robust networked BM for Smart Living offerings can be established and how strategic collaborations can be formed. Because of this duality, the Business Ecosystem as a subset of a BM is concentrated on in this research. Resultingly, the key research objective is to build an approach with which the interdependencies and relationships between Ecosystem actors are modeled in a dynamic way; thereby analyzing Ecosystem partner alignment and evaluating the robustness of the underlying BM. Hence, the research revolves around the below central research question.

'How can a Business Ecosystem for Smart Living services be established that ensures a robust underlying Business Model?'

A case study research was conducted to answer this central research question. This chapter provides the key conclusions in a structured way, and thereby answers the central research question. The data collection instruments used for answering these questions were desk research and a total of thirteen semi-structured interviews. The purpose of the last two interviews was to validate the conclusions drawn. These conclusions were also validated by making comparisons with existing literature in which approaches for Ecosystems are applied.

The process framework

This research integrates several BM tools in a process framework that delves into the establishment of the roles and corresponding actors for a Smart Living service; the evaluation of interactor alignment, misalignments and conflicts; the formation of activities to eliminate the misalignments; and an approach for sequencing these activities. The desk research yielded the BM tools with which these steps could be taken: the Partner Value Matrix, the VIP framework, an SD approach and BM roadmapping.

The Partner Value Matrix is used as an initial tool that delves into interactor value, information and process exchanges in the categories of the resources, sales channels, funds or other contributions they offer and receive. This is a preliminary analysis to select partners, as it visualizes the logic for them to engage in a partnership. Next, as part of the SD approach, causal diagrams are used to visualize this alignment, misalignments and conflicts between partners. These causal diagrams show the causality between VIP-related variables in different scenarios. Causal diagrams are particularly relevant when seeking to comprehend *dynamic* interactor relationships. The VIP-related variables can be linked to one or multiple key actors in the Ecosystem; including the end customers of the service. The end customer is not included in the existing academic literature in which the VIP framework is applied. This is the only key difference between this research and existing literature. The main reason for including end customers is that, when drafting causal structures and associated feedback loops, VIP interactions and value attributed by *service providers* cannot be detached from the VIP interactions and value attributed by *consumers*. Feedback loops only occur when including

exchanges between both service providers and customers. Within these causal diagrams, feedback loops thus occur which can affect the *value attributed* by the Ecosystem actors. This essentially means that causal structures can be explored that reinforce this value. Central to this approach is the common interest of the actors to collectively strive for economic and social value. This *value attributed* is a fourth component that was introduced on top of the value exchanges, information exchanges and business processes. The logic behind this is that it generates a link with the starting point of the STOF ontology: the service should generate value for both consumers and service providers. In context of this research, a discount of the insurance premium is a *value exchange* between the insurance provider and consumers that can be offered. This, however, does not necessarily imply that the consumers *attribute value* to this discount and, resultingly, are motivated to purchase the Smart Living service. *Value attributed* by Ecosystem actors is therefore distinguished from *value exchanges* between Ecosystem actors.

For the identified misalignments and conflicts, activities can be devised to adapt the underlying BM. These activities can subsequently be sequenced in a BM roadmap. This this approach thus links the analytical VIP framework to the plan-proces of BM roadmapping. The eventual objective of this is to improve the alignment between Ecosystem actor and thereby improve the robustness of the underlying BM; which is the dependent variable of this research. Finally, interviews pointed out that the alignment of strategic objectives, the complementation of capabilities, and the degree of trust between Ecosystem actors are missing stages in the process framework that may require dedicated tooling. It was concluded by the researcher that these features are, at least in part, included in the VIP framework.

Applying the process framework to the research case

Six scenarios were analyzed using causal diagrams, of which four related to *dynamic* interactor relationships. Because no interviews were conducted with individuals from the required departments of KPN, the causal structures often did not involve KPN as a telecom operator. Also, because of time constraints and preservation of readability, not all scenarios identified in the interviewees were elaborated on. Six scenarios were enough to present the advantages and disadvantages of the integration of the VIP framework and SD approach. The decision not to include more scenarios was thus made because saturation had been reached. The causal structures were evaluated by two experts in interviews for validation and proved to be coherent and logical.

SD helps overcome bounded rationality by visualizing these causal structures. Although the process of establishing the causal diagrams is time-consuming, they help understand causal relationships between VIP-related variables, allowing for scenario analysis and better-informed decision making. This is applicable mainly for exposing dynamic, but also for static dependencies and interactions between actors. Based on this, Ecosystem actors can assess if there really is value in establishing this service. It should be noted that causal diagrams only visualize causal relationships and not other types of relationships between variables. When comparing this approach to other approaches applied in academic literature, it can be concluded that only visualizing causal relationships results in a non-fully comprehensive picture of the relationships between variables in the Ecosystem. It does however present a means to record Ecosystem dynamics, allowing actors to discuss the truthlikeness of the scenarios considered. In these discussions they can come to terms and, step by step, delve further into the causal structures. Abductive reasoning is used to identify the causal structures. Since abductive reasoning can be regarded as inference to the best explanation, the truthlikeness of the causal structures that follow from this cannot be verified. An essential component of these causal structures are feedback loops, which are based purely on causal relationships and not other types of relationships between variables. The causal diagrams visualize continued increase or decrease of variables by reinforcing or balancing feedback loops. This allows Ecosystem actors to assess how value in the Ecosystem builds up over time and to see which variables should be manipulated to stimulate or block these feedback loops. It also allows them to think of the evolution of the

Ecosystem. This evolution can be visualized by distinguishing a current (t=0) and future (t=1) scenario. Within this research, this relates to the future value of collected data. This data can be used to redesign or expand the initial service, and create new revenue streams. This is the results of (i) reinforcement of existing feedback loops, and (ii) the emergence of new feedback loops.

Applying the process framework to the research case also showed that the fourth component that was introduced on top of the VIP components – the *value attributed* – allows actors to identify where the value they attribute to certain dynamics lies, and how this value is impacted as a result of changes in other variables. In visualizing this *attributed value*, the aspects on which actors find *alignment* become clear. This is essential, because the alignment between Ecosystem actors is a key feature of the VIP framework. As mentioned, the approach allows for better-informed decision making. Within this research, the decision making relates to the identification of activities with which the causal structures can be adapted to improve the alignment between actors and the *robustness of the underlying BM*. The strategies to enhance the robustness of an SD-based BM as derived from academic literature were useful to establish these activities. The strategies that were used, were*: improvement of the adaptability of the BM structure* and *introduction of a balancing feedback loop to improve tolerance to unpredicted dynamics in system parameters*. Because the quantitative phase of SD was left outside the scope of the research, no conclusions were drawn regarding the *elasticity* and *strength* of the causal relationships in the causal diagrams, and *the extent to which* the BM robustness is improved as a result of the presented activities.

Practical implications

The practical conclusions regarding KPN SmartLife, the research case, and lessons for Ecosystems in general are discussed next. From the Partner Value Matrix and VIP interaction and interdependencies diagram it was concluded that there is logic for each partner to cooperate to realize the service. Telecom operators such as KPN are perceived by other actors as an excellent party to launch such a service, as they have an extensive installed base, a high customer reach, and are known and trusted by their consumers. This allows actors to find new sales channels and revenue models. Concerns from the perspective of actors are which parties 'own' the data and the consumers. For the research case this is KPN, which makes other actors fully dependent and suspicious that KPN may start operating as a *dominator* in the Ecosystem.

One of the perceived root causes for the fact that KPN SmartLife did not reach an extensive user base was that there is a complex Ecosystem structure with numerous actors, and unclarity about the demarcation of which actor is responsible for what. Also, the service is rather expensive for customers, and insufficient attention is paid to the exact market demand for different features of the service. Apart from the complexity of the Ecosystem, the service itself was complex as well. This made it rather difficult for the market to understand what the service entails and what its value is. KPN started with an extensive service and not with a minimum viable product, where the market value and assumptions made were evaluated first before expanding it. This approach is perceived as a misstep by interviewees. The result was a *technology push* rather than a *market pull* approach.

With regard to considerations of actors to establish such an Ecosystem, a motivator is their belief that cooperation leads to an increased value for consumers. What should be paid more attention to, however, is the long-term vision. The Ecosystem actors should accept that these initiatives are at least a five-year process that requires substantial investments. One of the reasons why Smart Home security & safety solutions are expensive is because the central control unit is rather expensive. This has to do with the required technological features to meet security standards of an insurance provider, such as a battery, dual path-connectivity, an IP cable, a SIM card, and firmware to communicate securely with the remote control room. However, a key motivator to develop such a service is a longer consumer lifetime value because of the bundling of services. Average duration of client subscriptions are currently relatively short, especially with a telecom operator. Bundling

different services in a packaged deal creates stickiness with consumers. It becomes more expensive for consumers to switch because they will miss out on discounts. What is also important for this is to dare to let go of existing BMs: create one integrated networked BM rather than trying to link different BMs together. Another motivation that relates to this long-term vision is the aforementioned evolution of the Ecosystem. Data on generated by the service can be reused to generate new types of services. The consumer data that is generated using movement sensors can for instance be used to compose behavioral patterns of residents. These patterns can be used to generate an alarm in case an (elderly) person does not appear in a bathroom for a longer period of time. This additional service thus creates new reinforcing feedback loops and generates new value. This may even imply that the purpose of the initial (t=0) service is purely to collect data and that the BM is not designed to be viable – and thus not robust – whereas the future (t=1) BM is. Using causal diagrams, this can be coordinated by the Ecosystem actors.

The six scenarios, which were visualized using causal diagrams, contained several reinforcing feedback loops and mainly relate to: trust between actors, commitment to cooperate, alignment of strategic objectives between actors, effectiveness of the service, extent to which consumer data is shared, and lock-in of suppliers for sensor equipment. Noteworthy is the fact that *complementation of capabilities* was not mentioned as a concern by interviewees. Also, only one of the interviewees (interviewee E) mentioned a concern for the fact that KPN may start acting as a dominator in the Ecosystem. Initially, this was expected to be more of a concern, since KPN manages the platform, receives the data, and is directly in contact with customers. Based on these scenarios, which visualized alignment, misalignments and conflicts between actors, four activities were established: *incentivize data sharing by variable insurance premiums*, *establish an all-in contract with the security provider*, *simulate scenarios in trial phase*, and *exclude sensor equipment from the service offering.*

Incentivize data sharing by variable insurance premiums. People do not purchase these types of services for a discount on their insurance premium; they primarily do it to improve safety and security. The reduced insurance premium saves them several euros per month. The price of the service is much greater than the monthly benefits gained by a reduced insurance premium. Variable insurance premiums are thus not a motivator for consumers to purchase a service. For existing consumers, they are however a stimulator for desired behavior and for sharing their personal data. This is of value to the insurance provider, because with this data they can evaluate the effectiveness of the service in reducing damage. An incentive for consumers to share their data is thus to link the level of insurance premium discount to the extent to which they share their data. An example of such an incentive is to link the downtime of a smoke detector to the insurance premium: the longer it is unconnected, the higher the insurance premium. This presents a balancing feedback loop, as it incentivizes consumers to replace the batteries of their smoke detector. This way, the insurance provider knows that it turned on again, and the consumer and the consumer's home and home contents are better secured. Such an activity corresponds with a strategy described in academic literature to improve BM robustness: introducing a balancing feedback loop to improve the tolerance to unpredicted dynamics. The unpredicted dynamics, in this situation, is the lack of consumer willingness to share data.

Establish an all-in contract with the security provider. There was controversy among interviewees about whether there are conflicting strategic objectives between an insurance provider and security provider. Insurance providers intend to minimize damage costs, whereas security providers might be tended to send over security guards to improve their business case. An activity presented to resolve this potential conflict is to establish an all-in contract between the consumer and security provider rather than payment on a per-use basis. Then, sending over security guard would not improve the business case for the security provider, leading to a different prioritization of action.

Simulate scenarios in trial phase. Reliability of the estimates of the effectiveness of the service is improved if scenarios of fire or burglary are simulated in real-life experiments. These simulations are needed because the scenarios often do not occur during trial phases. This allows the actors to evaluate if the service properly generates alarm notifications and if the security provider acts adequately based on this input

Exclude sensor equipment from the service offering. As argued by the interviewees, the revenue model is not with the supply of this hardware. Also, consumers in the Western European market often prefer to choose the sensor equipment for themselves. Deciding for consumers what hardware they get, increases costs and creates a threshold for them. If consumers miss out on certain functionalities, they are likely to decide not to purchase the service at all. Also, incorrect estimations of consumer demand result in big inventories. Since the technology continues to develop, this hardware quickly loses its value. Consequently, it is advised to exclude sensor equipment from the service offering and create a whitelist of equipment that is supported by the central unit and platform. This activity corresponds with a strategy described in academic literature to improve BM robustness: reducing path dependence by making the BM more adaptive.

Final conclusion

Conclusive, to answer the central research question, the process framework presented in this research forms an approach with which an Ecosystem for Smart Living services can be developed. Central to this approach is the integrated SD approach and the VIP framework. Causal diagrams, as part of the SD approach, show the causality between VIP-related variables in different scenarios. The purpose of this is to analyze and improve the alignment, misalignments and conflicts in partners' interdependencies and interactions. To resolve the identified misalignments and conflicts, activities can be devised to better align Ecosystem actors and to adapt the underlying BM with the objective of improving its robustness.

6.2. Academic contribution

This research contributes to academic literature by integrating several tools in a process framework that delves into the establishment of the roles and corresponding actors for a Smart Living service; the evaluation of interactor alignment, misalignments and conflicts; the formation of activities to eliminate the misalignments; and an approach to sequence these activities. This framework delves into the areas of research on which new Smart Living research initiatives should focus, as argued by Solaimani et al. (2015b).

i. Business management: How can robust Business Models be developed?
ii. The networked enterprise: How can strategic collaborations be established?
iii. Strategic Ecosystems: Which roles will become key?
iv. Service marketing: What is the market demand?

The below figure (*see Figure 41*) visualizes how these research initiatives are covered in the different phases of the process framework.

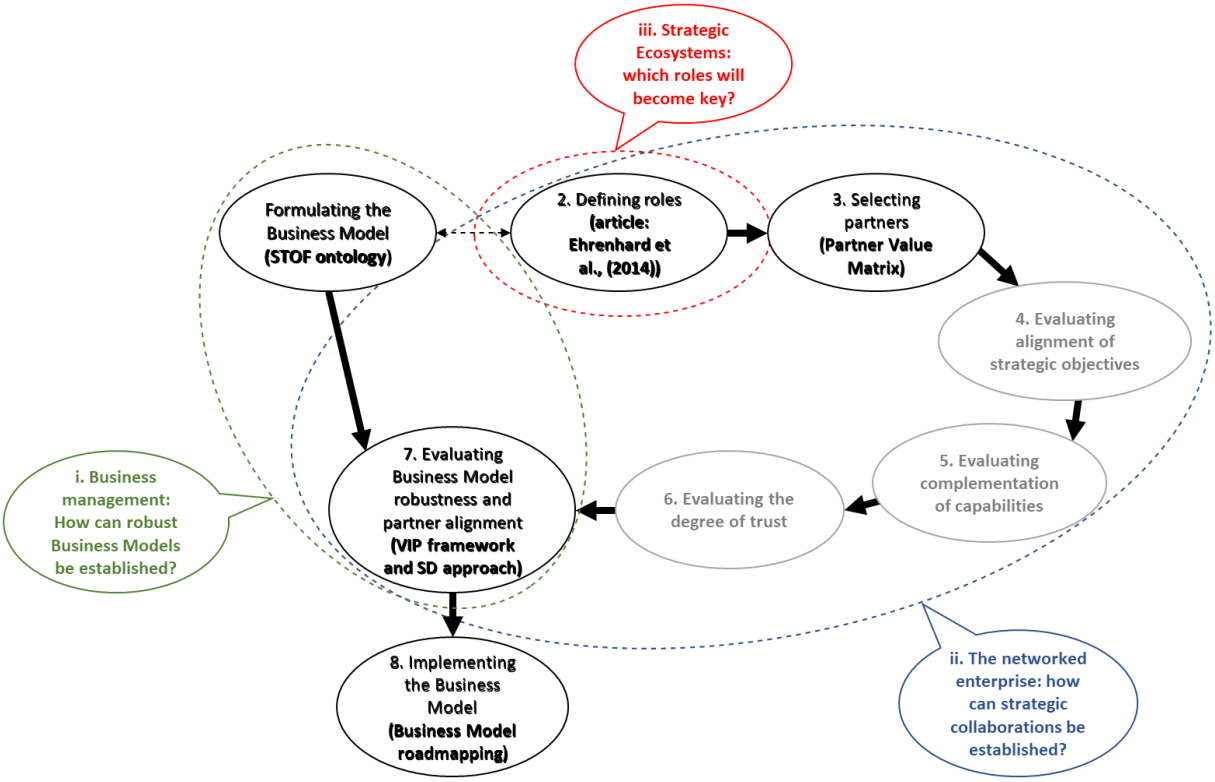

Figure 41 – Relation between the process framework phases and research areas.

The first research area: *how can robust Business Models be established?* is circled in green and includes the STOF ontology, VIP framework and an SD approach. The unit of analysis of the research is *a service offering as constituted by an Ecosystem of actors*. Because of this networked perspective, the research touches upon the knowledge gap of scarceness of academic literature on *networked* BMs in general (Heikkilä & Heikkilä, 2013). The key academic contribution of this research lies in the integration of the VIP framework and an SD approach to explore interactor alignment, misalignments and conflicts. As part of the SD approach, causal diagrams allow for visualization and assessment of different scenarios in which Ecosystem actors exchange value, information, and processes. These scenarios expose the alignment, misalignments and conflicts between the actors. The nature of these scenarios can be a static perspective – where the time dimension is not relevant – but the causal diagrams are particularly relevant when seeking to comprehend *dynamic* interactor relationships. This approach touches upon the knowledge gap introduced by Walenkamp et al. (2012), who state that dynamics in BMs and a prescriptive approach to tackle uncertainty and prospective BM robustness is lacking. By presenting these scenarios and visualizing them in causal diagrams, this research provides guidelines to delve into the uncertainties. The improvement of the robustness of the underlying BM is addressed in the following way. Based on the identified misalignments and conflicts, activities can be thought of to adapt the underlying BM. The purpose of this is to improve the alignment between Ecosystem actor and thereby improve the robustness of the underlying BM; which is the dependent variable of this research. Hence, this is how the research contributes to the proposed areas of research: *how can robust Business Models be established?*

The second research area: *how can strategic collaborations be established?* is circled in blue and is covered by the process of: defining roles; selecting partners; evaluating their strategic objectives, complementation of capabilities, and mutual of trust; and evaluating the BM robustness and partner alignment. Based on the required roles, the Partner Value Matrix is introduced as a preliminary VIP

analysis to select partners, as it visualizes motives of them to engage in a partnership. As concluded from the previous section, the integrated SD and VIP approach is a methodology that touches upon both the improvement of the robustness of the underlying BM and the establishment of collaborations between actors. Solaimani et al. (2010) states that, to ensure the viability of a Smart Living initiative, the robustness of the underlying BM should be considered by focusing on Ecosystem partnerships and partner involvement from the beginning. This confirms that Ecosystem partnerships and robustness of the underlying BM are inseparable.

The third research area: *which roles will become key?* is covered in the article by Ehrenhard et al. (2014). The results from that research are incorporated in this process framework. Finally, the fourth research area: *what is the market demand* is not covered in this research. This phase precedes the process framework. Finally, what was not covered in the potential fields of research for Smart Living specifically in Solaimani et al. (2015b), was the guidelines for the transition by an Ecosystem of actors from an existing (as-is) to the newly defined (to-be) BM. The issues that arise from the fact that this transition is managed by multiple players are particularly of interest (Groenveld, 2007). This is covered by the final stage of the process framework.

6.3. Practical contribution

The practical contribution is divided in the contribution for Accenture (*see paragraph 6.2.1*) and for KPN (*see paragraph 6.2.2*).

6.3.1. Accenture

As discussed in the first chapter, Accenture sought a generic approach for how to establish an Ecosystem with which Smart Living or other IoT-related services can be commercialized. Accenture lacked guidelines for how to bring two or multiple firms together to launch a such a service. In practice, they observed it is complicated to get firms work together on a service that is not yet there, on a vision that might not be aligned, or on a business case that is not always clear. From this research, Accenture wanted to learn how Ecosystem partners should be selected, how their roles should be defined and how it can be ensured that their resources, competencies, and strategic objectives complement each other. This aligns the practical contribution for Accenture and the academic contributions of this research. The process framework provides a structured guideline with which Accenture can approach clients in an informed way.

As concluded from the interviews for validation with Accenture, in establishing partnerships they have never reached the point where they can map out the causal structures. Often the partnership formation process ended with an overview similar to the VIP interactions and dependencies diagram. The interviewees argued that, although the approach requires a lot of work, there is practical value in the visualization of causal structures; particularly to start the conversation between different potential actors in complex Ecosystem structures. The approach makes it possible to evaluate whether there is indeed value in establishing this service for the actors. Visualizing the causal structures allows for a way of documenting the opportunity to, step by step, go into detail about the causal structures of different scenarios. Apart from that, this research yielded key learning about Smart Living Ecosystems that Accenture is interested in.

6.3.2. KPN

During the interviews, the root causes of why the KPN SmartLife service was unsuccessful in creating a large user base came to light. These root causes result from the statements made by individuals within different firms that are all involved in or affiliated with the KPN SmartLife service. This thus

offers a broad range of perspectives. Analogies were made by the researcher between the lines of reasoning of these individuals. These learnings are relevant for KPN specifically, but also for Accenture, since the development the SmartLife service was led by Accenture.

6.4. Reseach limitations

This paragraph presents the limitations of the research. Following literature on case studies (Sekeran & Bougie, 2016; Yin, 2013; Cunningham, 1997; Stake, 2008) it can be concluded that qualitative case studies are not easily generalized to other settings, are hard to replicate, and the results are dependent upon the perceptions of the researcher. Yin (2013) states that the quality of a case study is highly dependent on the expertise and competencies of the researcher. This may be a concern, as the researcher is not experienced and initially did not have extensive expertise on the key topics of this research: Smart Living and (networked) BMs. Also, meanings of the researcher are often not transferred to readers as-is but are formed to the reader's own conceptual space (Stake, 2005). Finally, the use of abductive reasoning can be regarded as inference to the best explanation (Sober & Elliott, 2013). This reasoning led to conclusions that cannot be verified and thus have a degree of uncertainty to them. To reduce these concerns, the researcher attempted to achieve redundancy in collecting the data. Also, multiple data collection instruments – interviews for validation and comparison of the research results with existing literature (Nikayin, 2014; Solaimani, 2014; Frijns, 2016) – were used to reduce these concerns.

it proved to be difficult to make interviewees reflect upon VIP-related variables and the causality between them. Especially the more complex causal structures are hard to draft without using supporting instruments, such as a notepad. The interviewees' lack of a deep understanding of the purpose of causal diagrams and the process of drafting them also made this a challenge. Resultingly, the researcher could not go into detail about interactor alignment, misalignments and conflicts. Also, the activities to resolve the misalignments and conflicts were not established *using* the causal structures, which is the intention of the approach, but were already established during the interviews with industry experts and key Ecosystem actors. The causal diagrams were only established *after* these interviews.

Next, because the case study was mainly focused on evaluating the process framework – particularly the integration of the VIP framework and SD approach – not all of the interactor conflicts for the research case were presented. The results do thus not provide a comprehensive overview of all case-related VIP-related alignment, misalignments, conflicts and resulting activities to enhance BM robustness. This is partly because not all perspectives of the key Ecosystem actors for the research case were included. KPN's perspective is not included because the dedicated two departments for SmartLife – New Business and Consumer Market – were not willing to cooperate in the research. Other telecom operators that were contacted proved to be insufficiently affiliated with the safety & security domain of Smart Living. Furthermore, no interviews with individuals from emergency services were conducted. What is also noteworthy is that interviewees often had misconceptions about the strategic objectives of other actors and what features of the service these actors attribute value to. This led to *perceived* misalignments and conflicts between actors that were not necessarily realistic. Another concern worth mentioning is that interviewees may have had the tendency to give desirable answers rather than exposing their true strategic interests. This may be the case because interviewees spoke from their role with their companies and were informed about the fact that the results of this thesis will be published on a publicly available online repository. Finally, because of the way the interviews were structured, it was not possible for the interviewees to sequence the activities to eliminate VIP-related misalignments and conflicts in a BM roadmap. The structure of the interviews was to go through the entire process framework. It was hard for interviewees to establish this sequence because of time constraints and an incomplete overview of all the proposed activities.

6.5. Recommendations for future research

This paragraph presents recommendations for future research initiatives. First, as was repeatedly touched upon, a recommendation for future research is to explore how this approach can be converted from qualitative to quantitative. For this, an option is to follow the entire SD procedure rather than just the qualitative phase. This quantification could expose the conditions under which certain business logic will fail or not, and it could assess the robustness of the underlying BM in these conditions. Another recommendation for future research is to find dedicated tools for the evaluation of the alignment of strategic objectives, the complementation of capabilities, and the degree of trust between Ecosystem actors (numbered four, five and six in the process framework). In this research, the integrated VIP framework and SD approach were used to evaluate these features. At this point it is however not clear if these are adequate tools to fully comprehend these dynamics. Especially hidden agendas or actors that are merely involved to stretch or frustrate the process are not expected to be exposed by applying the current tools of the process framework. It would be interesting to explore which tools are more suitable for evaluating this. Next, apart from the phase in which the roles are defined, the process framework is generic and not specifically usable for Smart Living or even IoT services. As long as a comprehensive overview can be made of the required roles, the framework could also be used for other types of services. A recommendation for future research is to evaluate the usability of this framework for other types of services for which Ecosystems are of key importance. Finally, it may be worthwhile to conduct further research on how the activities to eliminate VIP-related misalignments and conflicts can sequenced in a BM roadmap.

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I: Heikkilä framework

Heikkilä & Heikkilä (2013) developed a framework for the main activities needed to co-develop a networked BM (*see Figure 42*). They argue that gaining insight into this creation process guides the process of creating a networked BM, and exposes which decisions promote or hamper the collaborative development of this BM. The researchers do not state which BM ontologies and tooling should be used for this framework. For that reason, below explanatory text is complemented with suggestions for ontologies and frameworks to use for the process stages.

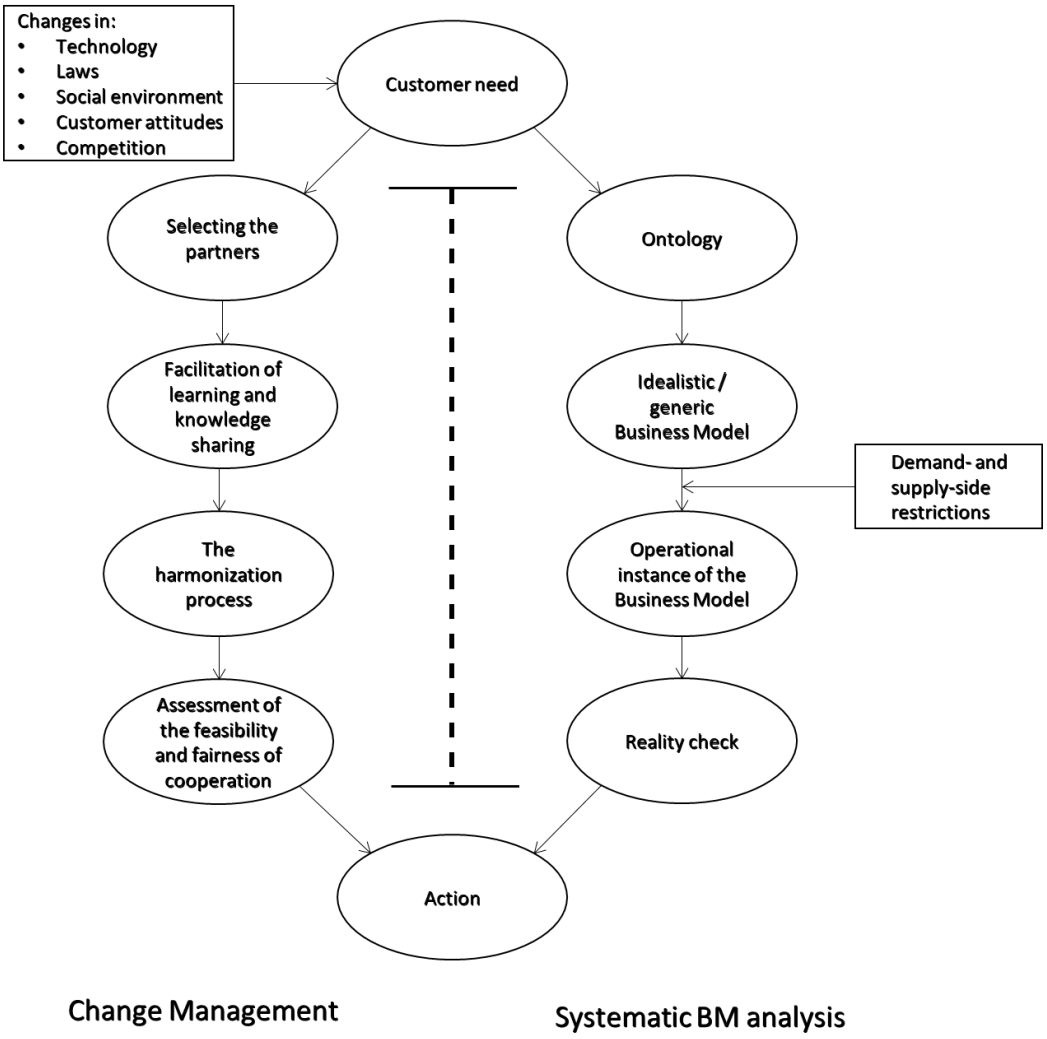

Figure 42 – Heikkilä joint BM framework. Source: Heikkilä & Heikkilä (2013).

Customer need

The starting point of the framework is a business opportunity results from changes in technology, laws, social environment, customer attitudes, or competition. In line with the arguing of de Reuver et al., (2009), new solutions should generate value for the customer, which means that the customer need for the solution should be evaluated. Next, the process splits up on two parallel subprocesses: the change management process (left in the figure) and systematic BM analysis process (right in the figure).

Systematic BM analysis process

- *Ontology*: the BM analysis starts with a certain BM ontology. Example are the Business Model Canvas, e^3-value, VNA and STOF ontologies (*see paragraph 2.1.3*).
- *Idealistic / generic BM*: Using an ontology a BM formulation can be made.
- *Operational instance of the BM*: What remains after considering the demand- and supply-side restrictions is an operational instance of the BM. Demand-side restrictions result from customer- and case-specific limitations, meaning for example that the BM could be feasible for a smaller group of customers than initially expected. Supply-side restrictions result from limitations in the service offering. An example of a supply-side restriction is a technological feature which turns out to be less advanced than initially thought.
- *Reality check*: the reality check is aimed at revealing the desirability, feasibility and viability of the BM.

Change management process

- *Selecting the partners*: As argued by the authors, there are no best practices for how to select networked partners or how to divide roles. This stage therefore case-specific.
- *Facilitation of learning and knowledge sharing*: the purpose of this stage is to reduce cognitive distance, allowing Ecosystem partners to better comprehend one another. The authors suggest brainstorm sessions and workshops can be used to facilitate this. Another option is to apply the VIP framework. As argued in the second chapter (*see paragraph 2.1.4*), the VIP framework is apt at revealing the alignment, misalignments and conflicts in actor interdependencies and interactions, and at presenting how to cope with the misalignments and conflicts (Solaimani & Bouwman, 2012a).
- *The harmonization process*: In this stage the strategies, processes and intra-organizational processes are harmonized. In context of this research, the VIP framework can be used as a tool for Ecosystem partners to start the discussion on alignment of, and elimination of misalignments and conflicts in their interactions and interdependencies.
- *Assessment of the feasibility and fairness of cooperation*: This stage assesses if discussions in previous stages resulted in an agreement by all Ecosystem partners on fair and feasible cooperation. If this is the case, the process can continue to the final stage: action.

Action

In this stage the change management process rejoins the systematic BM analysis process. Now, the formulated BM can be implemented. The researchers, however, do not suggest which tooling can be used to implement the BM. As discussed in the second chapter (*see paragraph 2.5)*, BM roadmapping can be applied for this cause.

II: Impact categories

Apart from the four domains distinguished, Smart Living technologies can be subdivided into three impact categories: enabling, mediating and transformational technologies (Venkatesh, 2008). These categories are introduced to allow the reader to conceptualize the levels of impact on the lives of residents of this wide range of technologies.

- Enabling technologies allow tasks to be performed in a better or faster way. An example of an enabling technology is the various features included in a smart thermostat[2]. The thermostat can be controlled remotely via a smartphone application, can track energy usage, and can switch off automatically when individuals leave their residence, and on when they return. These features are not radically life-changing but provide the ability to save energy and make the lives of residents more convenient.

- Mediating technologies facilitate between individuals and their living environment. The roles of mediating technologies in the day-to-day lives of residents has a higher level of complexity than enabling technologies. An example of mediating technologies is the Google Home device, which can broadcast to other devices, give weather forecasts, make calls, turn the TV on and off, and set reminders[3].

- Transformational technologies radically change the activities and lives of residents. For example, several technologies, such as cloud computing, Virtual Private Networks (VPN's) or video conferencing[4] are conducive to teleworking, i.e. IT-based solutions allowing workers to perform their work remotely from their offices, making them freer to decide when, how and where to work (Newell et al., 2009). Although the features of these technologies span beyond the domain of Smart Living, they allow for the integration and radical transformation of residents' home and work lives (Baruch, 2000).

[2] https://www.mysmartahome.com/12-features-of-a-perfect-smart-thermostat/
[3] https://www.businessinsider.nl/google-home-features-tips-tricks-2018-2/?international=true&r=US
[4] https://milner.com/company/blog/technology/2016/01/06/5-technologies-that-make-teleworking-more-productive

III: Achmea Homies

Homies is a peer-to-peer alarm platform offered by insurance provider Achmea. The generic architecture of this service is visualized in the figure below (*see Figure 43*). The Cocoon is a camera with which the home can be monitored from remote. The Minut Point is a sensor that monitors (ultra)sound, barometric pressure, temperature and data on air quality are used to detect deviations. While doing so, it is able to detect burglaries and fire. This device is connected to WiFi without a gateway. The service runs on a Microsoft Azure platform, which is connected to Whatssap groups. In the Homies Smartphone application, residents can select which neighbors or other people living nearby to include in a Whatsapp group that is automatically generated in case a the Minut Point is triggered. When triggered ,the selected neigbors get a WhatsApp message in which they are asked to examine the situation. They are instructed to immediately call the emergency number if they see smoke or fire. With this peer-to-peer platform neighbors collaboratively keep an eye on each other's homes and actively contribute to the reduction or prevention of damage to the house and contents due to fire or burglary.

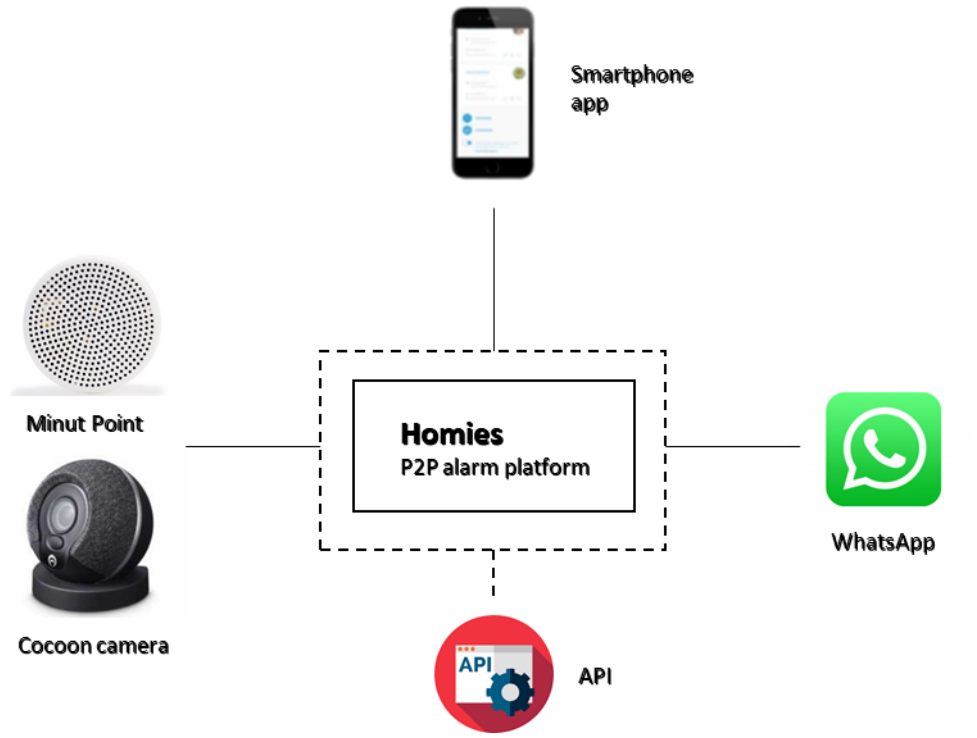

Figure 43 – Homies P2P alarm platform architecture.

IV: Interview protocol

Approaching the candidates

- Introduction of researcher.
- Explain the objectives of the research to the candidate (participant consent form).
- Explain how the candidate can contribute to these objectives (participant consent form).
- Explain the relevancy in participating in the interview for the candidate (participant consent form).
- Ask if the candidate agrees with voice recordings being made during the interview (participant consent form).
- Assure the candidate that he/she will receive an interview transcript after the interview was conducted. This gives the candidate the opportunity to correct or complement the information given (participant consent form).
- Ask if the candidate wishes to be anonymized. If so, his or her name will not be included in the thesis report (participant consent form).
- Thank the candidate in advance for participating.

Before starting the interview

Instructions

- Indicate the expected duration of the interview. Also ensure the candidate that he/she can stop any time, or skip questions.

Content

- Explain to the interviewee what he/she can expect during the interview.
- Introduce the interviewee to the structure of the questions and the themes that will be touched upon:
    - Inform the interviewee on the Ecosystem roles and which parties are approached for each role.
    - Introduce the interviewee to the process framework that is applied in the research.
    - Introduce the interviewee to the tools and ontology applied and what the objectives are for applying them (STOF ontology, VIP framework, SD approach, Partner Value Matrix, and Business Model roadmap).

About the interviewee

- Ask about the interviewee's background.
- Ask about the interviewee's role within the organization and if he/she could explain the key responsibilities within that role?

During the interview

Questions

- Ensure that opinions are not imposed on the candidate.
- Go into depth by asking for clarification and go into further detail if needed.
- Repeat what the candidate said to confirm that the interpretation was correct.

Concluding

- Check if any question, topic, or theme remains yet to be discussed.
- Summarize what was discussed and iterate how this contributes to the research objective.
- Thank the candidate once more for participating.
- Ask for permission to contact the candidate if new questions arise later.

After the interview

- Send the interview transcript to the candidate and ask him or her to check if complementation or corrections are required.
- Thank the candidate for his or her input.

V: Participant consent form

Participant Consent form for *A Business Model for Smart Living*

This participant consent form is set up by the researcher, Lennart Koorevaar, student in Management of Technology (MoT) at the Technology, Policy & Management (TPM) faculty of the Technical University (TU) in Delft. The objective of the research is to explore how a robust networked Business Model for Smart Living services can be established and implemented. A Business Model is *networked* if it is constituted by multiple actors in a Business Ecosystem. In this research, a process framework is derived from literature which includes tooling for how to formulate such a Business Model, how to select Ecosystem partners, and how to divide their roles. The framework also includes tools to evaluate the robustness of this Business Model and partner alignment.

As this research concentrates on *networked* Business Models, expert interviews are required to evaluate how the (Business Model) tools that are taken up in the process framework can be applied in a networked setting or in another novel way. I would therefore like to kindly ask you to participate by acting as an interviewee. Your personal information will be of minor relevance for the objective of this research. However, since some personal data may (intentionally or unintentionally) be collected, following General Data Protection Regulation (GDPR) it is your right to request access to, rectify, or erase the personal data that was collected. The interviews will be audio recorded and transcribed as text. These transcripts will be sent to you afterwards, allowing you to give comment. The eventual thesis report will be published on the TU Delft online repository (https://repository.tudelft.nl/). Once the research is published, the audio recordings will be deleted. The audio recordings will not be used for future (research) purposes. This form serves to inform you about these matters. The next page allows you to give your consent.

Your participation is much appreciated. I would like to thank you in advance.

Lennart Koorevaar

Participant Consent form for *A Business Model for Smart Living*

Please tick the appropriate boxes	**Yes**	**No**
Taking part in the study		
I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
I understand that taking part in the study involves an audio-recorded interview that will be transcribed as text. The audio recording will be deleted after the publication of the thesis report.	☐	☐
Use of the information in the study		
I understand that information I provide will be used for a thesis report that will be published on the TU Delft online repository.	☐	☐
I agree that my information can be quoted in research outputs	☐	☐
I agree that my name can be used for quotes	☐	☐

Click or tap here to enter text.	Click or tap here to enter text.	☐
Name of participant	Date	Tick box for consent

I have, to the best of my ability, ensured that the participant understands to what they are freely consenting.

Click or tap here to enter text.	Click or tap here to enter text.	☐
Name of researcher	Date	Tick box for consent

Study contact details for further information:

Lennart Koorevaar
(Telephone number)
L.W.Koorevaar@student.tudelft.nl

VI: Motivation of selection

The choices for the interview candidates for the research case are motivated below.

Interviews with Business Model tooling experts (see paragraph 4.3.1).

A. Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences

This person is co-originator of the Partner Value Matrix. His research at Saxion University of Applied Sciences focuses on (networked) BM's: how can tools for new BM's be developed? He can assess and help improve the process framework, can elaborate on the value and deficiencies of the Partner Value Matrix, and can explain about lessons to be learned for establishing BM's for Ecosystems.

B. Originator of the VIP framework and director of MBA at Nyenrode Business University

This person is the originator of the VIP framework. His research at Nyenrode Business University focuses on BMI and value creation of emerging technologies. He can elaborate on the framework, its value, and what the value is of integrating it with an SD approach.

C. System Dynamics expert at Delft University of Technology

This person is expert in SD and researcher at Delft University of Technology. She can help setting up an approach to integrate the VIP framework with SD.

D. Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology

This person is co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology. He can help integrating this tool with the other tools in the framework, and elaborate on how the tool can be applied for an Ecosystem rather than single-firm perspective.

E. Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku

This person is co-originator of the Joint Business Model development framework. As researcher at the University of Turku, she focuses on BMI enabled by digitalization, collaboration, and Ecosystems. She can assess on the process framework and how it can be adapted, enriched, and applied.

Interviews with industry experts involved in Smart Living services (see paragraph 4.3.2).

A. Former Solution Architect at KPN SmartLife and Senior Manager at Accenture Strategy

This individual is Senior Manager at the Strategy division of Accenture. As a Solution Architect, he was closely involved in the development and rollout of KPN SmartLife between 2013 and 2016. He can elaborate on the lessons learned from this project.

B. Product Manager at BeNext Smart Home

This person is product manager at BeNext Smart Home, a supplier of complete home automation systems. He is a project lead and explores the value of Smart Living services for business. Part of that involves the establishment of new partnerships and Ecosystems.

C. Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY

This individual is co-founder of Achmea Homies and is currently the director of Ecosystems & Strategy at INNOPAY. He works on establishment of Ecosystems for i.a. Smart Living services.

Interviews with key Ecosystem actors for the research case (see paragraph 4.3.3).

D. Business Director of the Alarm Service Center at Trigion

This person is Business Director of the Alarm Service Center at Trigion. Tirigon is currently involved in KPN's SmartLife service. They are expected to have an interest in service renewal as this can improve the client base and allow Trigion to expand its business. This individual can elaborate on how KPN SmartLife was established, what Trigion's considerations were to participate, and what the learnings are.

E. Project Manager SecuritasHome and Business Developer at Securitas.

This person is Project Manager SecuritasHome, which is a Smart Living safety & security solution offered by Securitas. He is also Business Developer and engaged in the formation of Ecosystems for innovative initiatives.

F. Strategic innovator at NN Sparklab

NN Sparklab, as part of NN Group, has shown interest in developing new Ecosystems to offer innovative services to its clients. The Smart Living sector is one of those focus areas. NN Sparklab was approached by KPN and Accenture to participate in KPN SmartLife, but refused. The considerations and motivation for their decision not to participate are interesting for this research. This person is specialized in Ecosystem establishment and can elaborate on the learnings from practice.

Interviews for validation (see paragraph 4.3.4).

G. Deal Execution Senior Manager at Accenture

This individual is Deal Execution Senior Manager at Accenture and has been involved in establishing innovative services, and Ecosystems, for telecom operators. He can help validate the results that this research yields and the approach that was adopted.

H. Deal Execution Associate Director at Accenture

This individual is Deal Execution Associate Director at Accenture. He was the lead of the KPN SmartLife project. He can help validate the results of the research and the approach.

VII: Interview transcripts

Interviewees for BM tooling:

VII.A Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences
VII.B Originator of the VIP framework and director of MBA at Nyenrode Business University
VII.C System Dynamics expert at Delft University of Technology
VII.D Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology
VII.E Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku

Interviewees for practical input on Smart Living

VII.F Former Solution Architect at KPN SmartLife and Senior Manager at Accenture Strategy
VII.G Product Manager at BeNext Smart Home
VII.H Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY

Interviewees for research case

VII.I Business Director of the Alarm Service Center at Trigion
VII.J Project Manager SecuritasHome and Business Developer at Securitas
VII.K Strategic innovator at NN Sparklab

Interviews for validation

VII.L Deal Execution Senior Manager at Accenture
VII.M Deal Execution Associate Director at Accenture

VII.A: Co-originator of the Partner Value Matrix and researcher Business Models at Saxion University of Applied Sciences

Introduction

I have been a lecturer with Saxion for a year. I'm active within both research and education. I do research on Business Models and focus on three topics. These are: (i) circular Business Models (focusing on sustainability), (ii) Business Models driven by digitization, (iii) Business Models in the context of entrepreneurship. Business Model tools for entrepreneurship are relevant there. I worked side by side at a consultancy / research agency. We look at new Business Models and tools to develop Business Models.

Partner Value Matrix

The Partner Value Matrix is a non-comprehensive tool, I would almost say. We are very interested in Ecosystems and networked Business Models that can arise within them, and also how you can conceptualize that and how you can model it. In doing so, the question also arises: what's the value of the Partner Value Matrix? It can be used as a start, but it is not something that goes very deep. Some other things came along in that discussion:

- Networked Business Model canvas: originally, the canvas takes the perspective of one party. In an Ecosystem you would say that each party has its own canvas. The question then arises how those canvases are linked to one another. Two or three years ago we looked at what are typical connections between canvases. This could be: if one party is a supplier, the earnings model of that party constitute the costs of another. We looked at which consistencies and conflicts arise when you look at that, and how you can get a grip on it.
- Paper of researchers in Groningen: they put a number of frameworks next to each other and look at which framework is suitable for shaping a networked Business Model. Even though you already apply the STOF ontology, this can provide interesting insights.
- e^3 value: software is now available for this tool.
- VDMbee: software that focuses on value modeling in multi-actor Business Models. The flow of value between parties also becomes clear using this. These tools go a little further than the Partner Value Matrix.

Partnership formation

However, these are tools that do not focus on the partnership formation process. That, however, is what you focus on. Wim Vanhaverbeke has written quite a lot about alliances and what demands the partners must meet, and about matches and conflicts. I also found literature from the Cambridge service alliance: *a process for B2B partnerships: designing to deliver capability across companies* (paper). I can also send this to you. That is about creating partnerships; that is indeed more appropriate than e^3-value, which assumes you already have the partnerships, or at least the roles, and are going to model that. After applying the Partner Value Matrix, the next step could be to describe the potential partners; why should they participate and why would they want to participate? What you could get out of it is, if you look more functionally at the required roles, and reason from a certain proposition, you can translate back: to deliver the proposition, what needs to happen, what complementary services do I need? You could deduce roles from that. With a Partner Value Matrix you can then see whether the roles are indeed covered, or conclude that there are different kinds of parties who all want to do the same thing, but together do not cover the required network roles. A business role is a collection of activities to realize the Business Model. You can look at that separately from partners; focusing only on the roles. The following step is: if I have that generalized model, who will fulfill which roles? The interesting thing then becomes: how do I select partners, who does what, and who maybe takes on more than one role. There are thus different

configurations that you could make. Perhaps something can be found about this: how do you arrive at a good configuration of actors to fulfill these roles?

Strategic interests

With the Partner Value Matrix, you look at what each party can bring and achieve in a quite functional way. But you can also watch actors who act as dominators. The other side is also the strategic interests: why should you participate? Perhaps that is also interesting: looking at strategic interests. Why would certain actors want to play certain roles? With regard to strategic interests you may have to deal with hidden agendas or partners that stretch or frustrate the process. Perhaps there are papers that describe how to form a partner network. Here the functional side can be looked at: who does what, and who needs what, and the strategic side: do the partners want this, and why? In the STOF ontology (Bouwman et al., 2008) there is a picture that connects the most important concepts from the STOF domains in a conceptual model. There are also models of each of those four domains separately. That also includes actors, business roles and strategic interests. I will also share the Cambridge service alliance article. This is about the design of a partnership, its management, and a number of case examples. I think this is from the beginning (how you design it) to how you keep it running. You try to realize this in your framework, and it is interesting that you want to link a number of tools together. That is also what is happening on the platform; you reason from a certain question and what are the tools that can help you, and how those tools are connected.

Capabilities

The role distribution and strategic interests of different actors are not yet mapped in the Partner Value Matrix, but what is perhaps also still missing is the capabilities. You could also include that. Do you have what is needed? Of course, you can talk about the roles, but if you are looking for a partner, you should also look at what its capabilities are, and how it can be confirmed that this party's capabilities match the required capabilities for this role. A partner can contribute in terms of resources but that does not mean that it has the competencies to fulfill the role.

Roles and actors

In addition, it is important to define the roles independently of the actors. As soon as you start talking about partners and actors, interests also come into play. You look at it more neutrally when considering business roles. It is not always so tightly ordered to first define roles and then assign partners to the roles. If I have partner X on board, my Business Model will be different than if I have partner Y on board. That is of course possible. That is why there is also a double arrow between Business Model formation and partnership & role definition in your framework. In a research case this becomes more specific. Looking at Smart Living services you know what roles you will need. When looking at actors, interests, resources, capabilities become more important.

Other considerations

But what else plays a role? That is case dependent. Regarding lock-ins you also have to take into account that, if you include a partner, you must be able to get rid of it. That somewhat relates to dominators and Ecosystem health. These are almost criteria based on which you would like to select partners. You do not want one partner who can provide a certain service. It is better to have several and to bring flexibility. This is argued as a central actor in the network that is in control. In case of proprietary technologies, I'm tied to a party. If I choose a standard, you can select multiple parties. Selecting partners: how do you see that? Is that from a focal actor who wants to achieve something and thereby seek partners? Or is this from an overall perspective? A telecom operator can be focal from the start, but you can also keep this open. I am dealing with research projects that cannot do alone. How do such projects emerge? I look for parties that also find the topic interesting, but that are also functionally complementary. Then I also ask myself: can I collaborate well with this actor?

Are they nice people so to say? Sometimes you prefer not to have a party on board because you don't feel the need to make that party wiser; despite the fact that the capabilities are present. A discussion that is now going on is that of Huawei and 5G rollout. The issue of trust is of great importance for the choice whether or not to engage in a partnership; despite the fact that regarding functionality and price it may be perfectly feasible.

Specifying to Smart Living

Specifying the Partner Value Matrix to Smart Living sector can be done by defining specific roles for Smart Living. Can you imagine on a generic level what everyone brings and what everyone could gain? Sometimes it is not complicated. A party that sells devices wants to participate in selling devices. The Partner Value Matrix is primarily made with the idea that these are concrete players. Then you can better understand partner motivations. While, at the level of a business role, it becomes a different picture. What is delivered is actually in line with the role you have specified. Then it will look a bit like a generic role model. You then describe per role: what does that role do? That is a bit generic. Certainly, strategic interests are not directly linked to a business role, but to an actor. To define the roles, you could look a little more at value networks and business role models. For example, I did a project with the objective to let people live at home for as long as possible using technology in the home (Smart Living). That was a project with all kinds of parties from different countries. You can make that model of roles, which is the same for every country (mainly technology). But if you then look at which party will play the role, that depends very much on the way in which care is organized in that particular country. The municipality may play an important role in one country and not in another. Then you could fill in a Partner Value Matrix per country and work from there. For each country you would then get a different configuration of parties to realize the same generic model of roles.

VII.B: Originator of the VIP framework and director of MBA at Nyenrode Business University

The VIP framework

The translation to an SD model is something that we probably have to think about for longer. That can be the assignment for you. I can inform you about how I arrive at a VIP interactions and interdependencies diagram. Step by step, what you do is primarily identify who the stakeholders are. That is actually quite a step. There are many actors who play a role; especially when you talk about network environments. Smart living is no different. With Smart Living I always think in terms of platforms and all kinds of service providers that offer their service on that platform. By definition this is a multi-actor environment. An important challenge is to identify the first-tier actors; who are the primary partners that make it possible to realize a value proposition? That is qualitative. You discuss this with partners, i.e. the project leader or other stakeholders. This way, you will get at a kind of empty framework with actors. Once you have the actors, the next step is to identify the interactions. In doing so, you can also immediately think about interdependencies. These interactions can be defined at different levels. The VIP framework invludes three: value processes, information processes, and primary / operational processes. Value processes are mainly about cash flows and transactions (often included in revenue models; which are often confused with Business Models), but can also be intangibles: goodwill or credibility. The information interactions can also be both tangible and intangible. Information can be information, data, a catalog, log files or even more structured: insights. If you have a large project in a network environment you will also notice that different forms / formats of information exchange are typically present. Next, we are dealing with primary processes, or processes that make the value proposition possible. For example, considering a mortgage: for the bank that provides the mortgage, we are not talking about the bank's HR policy but the primary processes: registration of applications, checking documents, and ultimately the decision to provide a mortgage. The challenge is to distinguish the primary and supporting processes. The moment you have all that, you have a descriptive picture of actors and interactions at different levels. How do those actors relate to each other; what is their relationship? That does not yet include dependability. I reviewed the VIP model together with stakeholders. Certain interactions are essential, and those interactions have owners. In a qualitative conversation I tried to look at the patterns of dependencies between actors from the different conversations with stakeholders and therefore from different perspectives. That already gives you an idea of which parts of the descriptive picture are essential and what makes organizations dependent on each other. It is a kind of qualitative process.

Whether the case is completely concrete or not, it doesn't matter. I assume that when you talk about a future project, you have certain specific ideas about how the project will be addressed. They must already have an idea of what the roles and requirements are, what other partners are needed to offer services. Does not really matter much in principle. You could review the model and see: what do you give and what do you expect (per stakeholder)? If this is the value exchange captured; then what information do we need? And what information do your partners need from you? The great thing about the model is that people don't immediately think in details but in terms of what comes to mind immediately. These are often the things that are very basic and important. That is what we need. We are not going to do process modeling; there are other tools for that. It is mainly at a higher level to identify what the dependencies are. This is mainly due to primary processes and value exchange. Not so much the processes that can be mapped with UML or BPMN. That is a completely different level. You ask what values do you hope to offer and what do you hope to get in return, and which parties do you need for that? And so on. If you have done this with different stakeholders, you will notice at a certain point that saturation has been achieved and there is a good picture of who the actors are and where the value exchanges take place. The moment you have those values, which data do you need, and which information systems? One step lower: which processes are then primary? What are the musts in the process; what should you do very well. Which compliance-like

things, governance-like things, which process execution and which checks and controls. Eventually you will arrive at the VIP interactions & interdependencies diagram. To make the picture you can look at my thesis book (Solaimani, 2014), page 190. Business process units, primary processes, behaviors, and so on.

My last paper (2018) is relevant for this. You can refer to this article. You can use table on the third page. The moment you have drafted this picture, you can do it in the same session, but I would do it in two steps. First speak to all stakeholders and make the descriptive picture. The moment you have heard from all stakeholders that you have completed the picture, you can use the same picture and have another conversation to find out what the interdependencies are for them. Who do you depend on and what are these dependencies? There you will notice that different types of dependencies arise on all three levels. Then you could make such a table and compare the dependencies of all stakeholders. There you will notice (that's what you do it for, and that's why it is an analytical and not a descriptive framework) that many dependencies do not match each other. People have certain expectations of others, and they cannot match at value level, or at info level or at process level. One can have a certain expectation of the other while the person does not have the infrastructure to realize this. This is an approach that helps me determine the Business Model feasibility and viability. Then it also appears that certain accountabilities are not completely well agreed on. The moment you have something (a certain idea) then you will notice that people always have different ideas of who should be held responsible for certain problems. People are aware of issues that may arise but not who is responsible for them. There are various ideas about this; and different interpretations. This undermines the implementation potential of the Business Model. These are the steps I have taken based on a Business Model that is actually concrete. That’s the starting point of course. VIP is a kind of lens through which you look at your Business Model to get order and to come to certain decisions: should we continue this and, if yes, under what conditions? What are the things that we need to fix to ensure a viable and feasible Business Model? You also look at which actors are still missing regarding missing VIP components. I have done many projects where in the and we came to the conclusion not to proceed. Or where we concluded to proceed, but these are the things that we need to repair or keep an eye on. I have never had a project in which we said on the basis of this analysis that we can proceed immediately. You could analyze a Business Model; you and I could do that. The power of the VIP framework is that you involve all stakeholders. You have a systematic process where the input from all stakeholders is collected. The underlying idea is that, when a project fails, nine out of ten times it has to do with consistency or contradictional issues between stakeholders. We often have to deal with that; actors do not have the right expectations, wrong attunements, incorrect assumptions, incorrect contracts, incorrect wishes or a wrong perception of reality. VIP is a network-oriented analysis of this to arrive at a sound judgment.

System Dynamics

I can imagine that time is an important dimension here. A stakeholder delivers something, and expects something in return. Then he gets it back, but not yet complete. That undermines his expectations. Based on that, there is a different kind of behavior or output, or it influences his wishes. The fact that going back and forth / sending and receiving certain values or objects (data, values, etc.) could have an impact on ultimate network behavior. System Dynamics could play an important role in this. Very concretely: we are in a project and your analysis, which I need, depends on the validity and completeness of my data. You receive data from me, and the quality of data influences your analysis. Your analysis then provides certain insights with which a third party can do certain things, with which the customer becomes happy or unhappy. That could have an impact on the number of requests that I receive. Let's say it's a triangular relationship, very simple. I immediately see a reinforcing and a balancing loop there. The moment my data is of poor quality, which makes the analysis less good, ultimately less value is released by the third party. What it comes down to is that you have to start thinking in terms of a time dimension. I have taken a snapshot of a certain project; you have to make an animation. I have looked at a project picture, you

have to watch a project video. The moment you run the video, you will notice that it is not only about what has been agreed on, but also about different scenarios that may occur. I try to place those scenarios in a two-dimensional picture, but you can also draw the interaction moments and make a representation of the scenarios that are all possible and the effect this has on the entire network. So I think it makes sense and that System Dynamics always makes sense when we look at a complex picture. If you have two or three actors, using System Dynamics is probably overkill. It becomes interesting if you have multiple actors and value exchanges and dependencies at different levels between those actors.

Research case

I would say: select a case. It becomes very difficult since you are doing several things at the same time. You are thinking up a methodology and thinking up a case. That is very difficult. If you don't have a case, the question is how you can show that your method is relevant? Does this methodology indeed do what you claim? It doesn't have to be that way. In this case, I think you need something of a substance to be able to design a method around it. I would almost like to say: start writing a case based on available data. There are of course many papers; I have published them myself as well. This way you can describe a kind of use case / illustrative case of a few pages. It states that there is a Smart Living platform, in which so many actors participate, also give the actors a name, and what are the responsibilities. The moment you have that, you will have a departure point. Then you can formulate your Business Model and apply the VIP framework. If you have nothing at all in terms of input, it becomes difficult. In some studies it is not allowed to work without emperic data. Ask your supervisors if you can sketch an illustrative case based on which you can then analyze the process. Describe your Smart Living service based on collected references. And then check if the methodology that you have devised works. You then take the Business Model and describe it using the Canvas / STOF based on the case description that you have already done. The next step is to look at the VIP interactions and, at the very end, to display your analysis in three dimensions. I think that's a better sequence; so you have a systematic and substance to speculate about. It remains speculative, because you have devised the case yourself. The conversations you have with experts are probably focused on the method. I tried to keep it as concrete as possible, but without a case your conversations could become abstract. Without a case, people start suggesting things, but you have to be careful that you don't get lost in abstract things. My suggestion would be to develop a case or to take an existing case. Perhaps you can get a Smart Living case from somewhere. They are often sold as papers for a small contribution. I would then use that as a basis to make your drawings and let experts give suggestions. As far as I'm concerned you can take a case from my thesis book (Solaimani, 2014). The Business Model and VIP framework are already included there. Of course, you don't have to do all that over again. You will probably have to rewrite the case in your own words. This cannot be very difficult because a Business Model and description, and a VIP diagram are all in my book that you have at your disposal. On that basis you can then fully focus on the integration with a System Dynamics approach. Then at least you have a substance. Then you can actually show a Business Model and VIP model during your next discussions, i.e. something concrete to show. I think that connection with System Dynamics should be approached longitudinally. You have to take the benchmark and perhaps start following actors; what are the things they do, the reactions and the possibilities? You can then look at the balancing and reinforcing feedback loops there are in the contents in which you do the modeling.

Linking to the STOF ontology

STOF is an abstract representation of a Business Model. It says something in terms of: we are going to create a platform and it will facilitate ordering taxis. There is a technological component: an app or server. A financial component is the fixed and variable costs. That is a general representation and ultimately it explains what the value proposition is and how money can be generated. This then describes Uber's Business Model. The VIP framework then says: these are the actors who play a role

in it and what their responsibilities are and what goes back and forth in terms of values. That is one level lower. I do not immediately see how you will be able to make a direct link between VIP and STOF in a System Dynamics approach. I can imagine that you have the processes and information exchange and do not see it as a snapshot but include a time dimension. I can imagine that you make multiple drawings for multiple scenarios, where System Dynamics helps with scenario analysis. If you wanted to do it even better, you could quantify it. You could say: if we take the triangle of three companies (one provides information, the other methods of analyzing something, the third offers it as a service to a customer, the customer provides money and this comes back into the chain). If you can quantify, the validity of data gets certain values: if the noise of the data exceeds a certain threshold, we get a kind of reinforcing loop that makes the analysis less valid and the value created less, and so on. You can run models from this quantification and further investigate under which conditions certain challenges are present or need to be tackled. The time dimension and quantification make it easier to tell something about the conditions under which certain business logic will fail or not.

VII.C: System Dynamics expert at Delft University of Technology

Focus

The focus is on causal diagrams and not, for example, on stocks and flows diagrams. Causal diagrams describe how variables are linked to each other; with positive and negative relationships. Causal diagrams are not quite the same as System Dynamics. It is a technique that you use for it, so it is important to make a distinction between the two. The System Dynamics method is basically drawing up stock and flow diagrams, giving them values, and then simulating that. So you have a qualitative and quantitative phase. The qualitative phase ends with a stock and flow diagram. Usually you will initially make a causal diagram of the situation. This includes feedback loops. The point is that with System Dynamics you look at variables instead of actors; so this is a very different perspective. You must always be able to measure variables and variables must be able to increase or decrease. This way, you can explore which feedback loops are present. I imagine that could be interesting. An example of a variable in this picture would be the number of customers. You have certain variables that can be influenced by certain actors, and often you say: we want to know how certain variables behave over time. That is the ultimate goal. For that you must be able to say: what are the most important indicators in the system? Looking at the VIP framework, for example, this would be the completeness of the data that is shared between actors. With System Dynamics you will therefore look at which factor influences these variables. So you go further back; what influences each variable? But you also move forward: where does it have an effect? And there can then be feedback loops. You then get a very different view, such as that of the article we have in front of us (Abdelkafi & Täuscher, 2015). You must then know in advance what you are interested in. So there are one or more central variables, of which you want to see how they develop over time. That is the starting point for making your causal diagram. So you actually make it based on a question. How do these central variables develop over time? I can imagine that this offers a different view and that you can say: you can relate some things to a certain actor, and some you cannot. You could use colors or another indication for this. If, within Business Models, you intend to look at finances, you will also have to focus on an indicator or certain indicators and have success criteria to define: when is it a succes and when is it not? You must carefully consider the relationship between your VIP framework and your causal diagram. The reason for creating a System Dynamics model is usually: something does not show desired behavior. For example, I see a variable decrease. You then identify what is affected by it, and can I find a measure or influence on a variable to balance it? How can I influence the system? Often it is useful to impact the system with a feedback loop, because then you often have a big effect with little effort. The question you will have to asnwer is: what are the central variables and how does that match with the VIP framework?

Stocks and flows

Maybe you can use this picture (Figure 5.11 in Solaimani, 2014). You can also look at the current flows; for example, cash flows. If that is relevant, you can for example show how money flows between the various actors. You can then say what influences these flows. That is not a causal diagram but a stocks and flows diagram; instead of variables that influence each other. That is also an option. For example, if money flows from the funding institute, the satisfaction of their wishes may be a variable. This influences the money flow from the funding institute to the platform provider, for example. The better that connection, the more money flows. You could then also look at it in a stock-flow way. Sometimes you get feedback as a result, but that is not the idea. Market visibility, for example, does not flow, that is a variable that can go up and down. The starting point is then different. You can also turn a stock-flow diagram into a causal diagram and vice versa. I don't know if those flows and controlling them are important; so that certain stocks increase or decrease. What you mean mainly relates to causal relations, and not flows. For example, you can have a loop between the attractiveness of a product and the number of customers. The more customers I have, the more attractive my product might be (because they can invest more in improving it), and the

more attractive it is, the more customers I get. So that is a feedback loop. If you want to model that, you will have to say: I have *customers* and the attractiveness of a product and because the product becomes more attractive, new customers are added. *Change in attractiveness* and *change in number of customers* can be modeled as flows and *attractiveness* and *number of customers* can be modeled as stocks. It is not absolute that these *are* stocks. If there is a loop somewhere, there should be at least one stock and one flow.

Causal relationships

You say that there are relationships between Value, Information & Process-like variables. There may be causality between different variables that fall within these categories (looking at Heikkilä et al., 2015). They are not independent. How we normally do this is as follows. Normally you have something of a problem owner. Then you assess: what is the problem, and how do I define my goals? These variables are important, for example; I want a number of passengers and a limited operating loss (airline). Then you evaluate for all your actors: what do they want, and what are the most important variables for those actors? Next, you evaluate: what influences those variables? Eventually you can put that in a system diagram where you have variables on the right that you find important, above the variables that cannot be influenced by the actors in your system, and on the left are the measures they can take. This way you can see which variables the actors can influence. So you do need criteria based on which you determine: does my Ecosystem work properly? That can't be twenty criteria. That also depends on who you want to do it for. This is how you operationalize Ecosystem health; which will then be central. And then you look at which of those other factors have an impact on Ecosystem health; and how. (*Input Lennart:*) Next, those measures, or activities, can be set out in a Business Model roadmap: these adjustments still have to be made to the Business Model to improve this. This way, a link can be made with the methods in the system diagram.

This is more a system perspective rather than a System Dynamics perspective. With System Dynamics you always start with a dynamic hypothesis: what is my problematic variable, how does it behave, and so on. Problem articulation, formulating dynamic hypothesis, causal loop diagramming, stock and flow diagrams, and testing a simulation model from there. That is the entire modeling cycle of System Dynamics. You can use all kinds of techniques to map the system structure. What do I consider inside and outside of my system? What kinds of subsystems do I distinguish? This also includes causal looping and stock and flow diagrams; different techniques. I wouldn't call it System Dynamics, but maybe causal relation diagrams. You are more concerned with the causal structures. If there are no loops, you will not get any dynamic behavior. Then the system remains linear, basically. There will probably be some causal loops within VIP, but they may not be central. So use the terms causal relation diagrams and system diagram. It is again important to first define the purpose of the operation of the system. How do I operationalize that, and how do I determine whether that goal will be achieved? How will I determine that my Ecosystem is healthy and what does that affect? When is the system “successful”?

VII.D: Co-originator of the BM roadmapping tool and researcher IT platforms at Delft University of Technology

It is a Business Model of multiple actors; that means that multiple actors have to change their Business Models. A focal actor can have leverage regarding the architecture. The actor then directs the way in which other actors in the Ecosystem work. If Apple wants to do something else with their iPhone in the app store, they can simply implement it. That is also a networked Business Model. I would not say that they are a dominator, but because of the things they do they can have an impact on others.

Scoping

The question is how to adjust the Business Model roadmapping tool to make it implementable for a networked setting. You have to ask yourself: what do you want to include? Is that just the content or also the process? It depends on whether the process of how the Ecosystem is established and which agreements are made in the process. Trust is an important factor here; this must be built up. Does this have to be in your roadmap? Or do you assume that the intention is already there? It could be logical to include this. You also have to make the dependencies between operations clear. Is it an assumption that you already have this clear or do you include it in the roadmap? This can already be achieved by the conclusions from the combination of VIP and SD. That would mean that these are not activities within the roadmap itself. It makes more sense if you first ask yourself whether to integrate the Business models and operations before you go to the implementation phase (roadmap). My big question is what the challenges are and whether they should be included in the roadmap (solving those challenges) or whether it is a given that these issues have already been solved. For example: do all partners have an interest in this? Or where are the links between our processes and what is missing in that regard? Are those things that have already been solved in advance or is that part of the roadmap? Is a first step in the roadmap to look at what the processes are in both organizations? The next step is to determine where are the links between those processes? This is partly in the Partner Value Matrix and mainly in the VIP framework. From the VIP framework you can conclude: where are the problems? You will then solve this in your roadmap. So you are going to do a test run to ensure that one party adjusts its business process in this way in order to connect. You should be able to conclude these specific actions from the VIP analysis. You then have to solve these problems. These are activities to bring about change in the Business Model. I wonder if you still need to look at the desired Business Model change as a first step before you deduce required activities. After all, you have already done that VIP analysis. You already know what the Business model should be, you already know what comes out of the Partner Value Matrix, so you actually have those first two steps of the roadmap (required BM change and its effect on other Business Model components, for the individual actors). Shouldn't you deduce from this what the activities are? Perhaps it makes more sense to say that the first two steps coincide with what has already been done. The VIP analysis mainly shows what the problems are; what are the conflicts regarding Value, Information and Processes domains. You have to do something about these conflicts in your roadmap activities.

The ‘networked’ part

As with a normal Business Model roadmap, with a networked Business Model roadmap you need to map the Business Models of the (structural) partners in the Ecosystem separately. What is extra is the link between those Business Models, and what issues are raised during the process. This is a result of the VIP analysis. These issues lead to additional activities that can be included in the roadmap. In the end it is not the sum of the parts, so the sum of multiple Business Model roadmaps, but something else is added: the interactions, the problems, and dependencies. Would there be more? In addition to the entire political side around it, you can ask yourself: do the partners like each other? I assume this is all outside the scope. Strategic objective complementation has to do with

framing, reframing and negotiation; this is being worked on in the organization and governance sections. I think you should leave that outside the scope.

It seems interesting to me, you get multiple Business Model roadmaps that you have to bring together. That is difficult because the question is who should be the first to take action, and what are the interdependencies between actors? That's extra when comparing it to a Business Model roadmap for a single-firm perspective. From the VIP framework you get extra input related to the networkedness. The paper (de Reuver et al., 2013) assumes that you initially only have a vague idea. The roadmapping process prescribes what could be the change in the Business Model. If you use it in a sequence of multiple tools, then of course it works differently. One tool should provide input for the next tool. Maybe you can skip a few more steps in the next tool. The scientific challenge lies in connecting the tools with each other.

Specifying to the Smart Living sector

How can you specify the Business Model roadmap to a Smart Living service? What would specific activities be? Very specific is installing sensors and linking them, but this is not what you are looking for. I don't know if this is so specific? This is still a question. We have a report from Envision comparing all kinds of different roadmaps. It discusses: what are the activities that recur in those roadmaps? The paper (de Reuver et al., 2013) provides little guidance in this. It might make sense to focus on these recurring activities; I will send this report to you. You can then ask yourself how the roadmap can be specified to Smart Living; I don't really know that myself. I also wonder if that is necessary. The framework so far can still be used for all kinds of services; not specifically IoT services or even more specific: Smart Living services. This makes it interesting. The question then remains: you have applied it to a specific case in a specific domain. What does this mean for broader applicability? This is the question with every study. An issue could be: does the context of Smart Living make a difference when looking at the framework? I don't see that immediately. So then it doesn't have to be contextualized either. That will help you understand your case: what are typical roles in Smart Living? You have already done this. This is not necessarily a specification of the framework, but rather a background to the case. This can perhaps be included as a step in the framework: look at case specific roles. It must be indicated in a way that domain knowledge is important when using this framework. That is of course always the case when you use a tool. If you do not understand what is going on in the application domain, you do not have a good thesis. That is always important. At the end of your thesis I would like to know how important that was. How did the specific context of Smart Living determine what you did in your analyses? I see academic value in a general approach for this.

Connecting the VIP framework to a Business Model roadmap

My criticism on the VIP framework would be: it exposes up all kinds of issues, but how are you going to solve them? That last step is actually missing. The VIP framework is at best an analysis framework and not a “plan” framework. But roadmapping is. There are activities in Business Model Roadmapping, which makes it more practical, but they are not linked to the VIP framework. The VIP framework is conceptually much better than the Business Model roadmap. The roadmap still lacks a bit of conceptual substantiation. If you can make the link between those two tools, then you solve a problem with both. That would be relevant. The question is whether you can translate the conflicts that arise from the VIP framework into the activities in the Business Model roadmap in one go. What is in between? Do you first have to model a new situation in which those problems have been solved? This also depends on the nature of the problems. Or should you, for instance, first prepare a process diagram that includes these interactions? Or is this not necessary? Perhaps this is one of the activities that could be included in the roadmap (making a process model). Suppose you have a list of four VIP conflicts, you don't want to put it in your roadmap: first solve problem one, then two, then three, and then four. You want to offer something more. The question may be how you can

introduce best practices in this. I'd just go and do it. You will apply this in a case. So go see how far you get and whether you indeed miss something. What is missing indicates something that is still needed in terms of follow-up research.

Other missing elements in the framework

Looking at Ecosystems, in addition to issues with confidence and transparency, there are conflicting interests, conflicting strategies and conflicting revenue models (one actor wants mainly to sell devices and the other wants to give them away and make money from services; this is also relevant for Smart Living). There's also conflicting processes and process scalability; or information models that do not match. These things can also be solved in a roadmap. You could change your Business Model or agree that one party will then receive a share of the service revenue.

Applying it to the research case

You can draw up several concept roadmaps and map out what the overlap is and the conflicts between those roadmaps. You could include this in your framework, but that does not necessarily mean that you have to apply it yourself in the case. Maybe you should see how far you get in your case and evaluate what problems occur and where. If something does not work out in the case later, that is not necessarily your problem. You have connected and expanded a number of tools. If you find out that something is not working, then at least we know that. Then we don't have to do that anymore. What you do is new, you are not going to apply something that is the standard and that will yield results without question. In that case, it would be your problem if you were unable to deliver. The case can also be an illustration of what you have done. From this you can analyze what does and does not work in practice, and gain ideas for further research.

VII.E: Co-originator of the Joint Business Model Development framework and Research Manager (networked) Business Models & Ecosystems at University of Turku

Introduction

My focus is on Business Models and Business Model tools. I often do projects within companies. The challenge is to do this in networks or Ecosystems. Companies are used to design products for themselves and maybe even the Business Model thinking. When it comes to a situation where the Business Model requires collaboration with other companies they often ask us to be involved. I'm from Information System Science and now in Business School. What I'm involved in is a combination of Business modeling and digitalization.

Evaluating the process framework of the research

It is a good idea to reshape the framework and fill it with Business Model tools to establish an Ecosystem. To evaluate the alignment of strategic objectives between parties involved, what we have been doing in the projects we have had, is we had discussions and different kinds of workshops. We tried to make the companies express what their objectives are, but we haven't had any tool for that. Especially the 'evaluation' part. Many times, we make conclusions, but each of the companies evaluate the other companies' objectives. This is very delicate in a way that sometimes companies are telling some truth about their objectives, but maybe they are not expressing everything. That is why it is done in repeated steps. During the project they get to know and can gradually express more as they learn more about the other companies. There is no tool that we have been using, but it is interesting to think about what would be possible. Actually, this comes back to the definition of roles. If we think about the companies and their objectives, this should somehow be reflected in the roles and tasks they are taking. Finally, if we get a set of roles, it expresses part of the objectives. Roles also relate to capabilities; so there should be different iterations in your framework. Currently I have a project with a challenge for an Ecosystem we're trying to set up. We know that we need a specific type of technological provider for the maritime sector. We thought that we had a partner for that, but in the end this firm is not joining. We have to start the process again. This relates to the roles you're mentioning and capabilities. Then we had to select the parties. Here we had to ensure that companies didn't have conflicts with each other. This is related to the objectives of the companies; are they competing for the same roles. If they participate in a collaboration, can they agree? Can there be different kinds of roles? And then how do they share the information with each other?

Looking at your framework, it looks good, but you have to reason from the one trying to build the Ecosystem. Use that to define the kinds of roles that are needed, and then start connecting to the potential partners and take them in. What would company A like to receive from this joint effort? And the others? That flows logically, but there are still iterations in real life. It is not straightforward. Getting back to your questions, it would be useful if there would be tools for doing these steps (evaluating alignment of strategic objectives, complementation of capabilities and the degree of trust). Up until now we have been trying to think of this in workshops and many other things; even acting, to share knowledge between the companies. If there would be tools, that would be useful. It is a lot about negotiation. If you look at tools for negotiation, you can get some insights. I know some; so maybe these could be used if incorporated in the framework. That might be possible. Multi-criteria optimization is an option for this to define goals/criteria and weigh the potential outcomes according to the criteria. If you want to select a house for instance, and have three options. You will have criteria for living, and can give weights to these houses using these criteria.

Original framework

In theory the change management side and systematic Business Model analysis side in my original framework (Heikkilä & Heikkilä, 2013) could be brought together using the VIP framework, as you propose in your adapted framework. There could still be other missing steps in your framework but thinking about Ecosystem building I currently can't think of any. I used my framework in at least two or three cases. We didn't design it beforehand, however. It is a description of what we learned during the Ecosystem building process. It is a description of how it went; on a conceptual level. We didn't have it when we started the case. There are different kinds of Ecosystems or networks that are very different from each other. Some include research and development, and some include repair operations. I've been working at machinery providers. Often the service business requires different kinds of networks. Also, the setting is different. The challenges to establish the Ecosystem can vary greatly. When we are designing a joint service for joint customers, it is very challenging. This often does not happen in vacuum; there is a history. Also, the current ways of doing business has an influence. Companies are often used to subcontracting. Then designing an Ecosystem in which the subcontractors will be *partners* (so a different structure) is a very different approach. The subcontractors are then used to acting when they are paid on a subcontract basis. Many times, there are challenging discussions and negotiations and they fail quite often. It is always easier to continue with the old ways of doing business rather than realizing big changes.

Specifying to the Smart Living sector

In your thesis you need to describe the case, the history, and the background. That is what I would do to specify the case to Smart Living. For selecting partners, I will send you links to papers. You use the Partner Value Matrix, but there is also an approach based on the Moore Ecosystem picture. We were thinking of the clock speed of different areas (technological change, research insights, customer demand, competition/co-opetition, social environment, policies & legal environment. That is just food for thought. It includes how different external environments affect your ideas. *Technology change* is mostly changing most rapidly. The *policies & legal environment* is the slowest one to change. When building an Ecosystem, using this picture you can think of which partners you need. I need someone who is representing for instance the *legal environment,* so we know what is happening there. One way to think about is to assess all *types* of roles that are needed in the Ecosystem. You have to think of this from many dimensions to evaluate what kinds of partners you need.

Other challenges in different stages

In forming Ecosystems, how resources, knowledge and capabilities are shared across firm boundaries is a key issue (Heikkilä & Heikkilä, 2013). It is all about how the people exchange the knowledge and are willing to collaborate. In a way that is important when building the Ecosystem. But of course, in later stages, the money issues come into discussion as well. Other issues emerge as well. Also, the branding may be difficult. Under which name are we offering this product or service to the market? For instance, in your case; is this going to be the telecom operator? You should also ensure that there always is a partner involved that has the access to the customer. This partner does not necessarily need to be the keystone actor. It is however easy for this partner to act as a dominator.

VII.F: Former Solution Architect at KPN SmartLife and Senior Manager at Accenture Strategy

With regard to Ecosystems, what is interesting is: what are the roles, how do they relate to each other and what does each such a role mean? What does it mean for an Ecosystem and what does it mean for my organization as such? What should I have in place, and what are the Ecosystem functions that I need to be able to do that properly?

Context KPN

The project of shaping KPN's SmartLife service started in 2013. I was involved from the beginning, up until 2016. KPN is a large organization with KPN corporate as its main brand and a number of sidebrands, such as XS4All, Hi, KPN International. KPN New Business (formerly KPN Strategy) is a strategic organization that is part of the corporate. The objective of this organization is to develop new Business Models for KPN. In 2011 it was already decided that something should be done with Smart Living, so they initiated a market analysis to see what kind of people would want Smart Living services and what kinds of propositions people want. Do they want a smoke detector, or a care package, or medical propositions? And in addition: what is the value? What is the market that you create for KPN? Conclusion from this analysis was that there was a positive market projection for Smart Living; specifically:

- Regarding the *safety & security* domain: an IoT home security solution. This could be made professional by including a security provider such as Securitas.
- Regarding the *energy management* domain: this is increasingly becoming an important topic because of increasing energy costs. Think of the current increase of €332 per average household; back then this was already relevant.
- Regarding the *healthcare* domain: this was specifically aimed at the elderly; keeping in mind the aging population.
- Regarding the *comfort and entertainment* domain: This was a free format; meaning that various types of features could be integrated in the service.

Subsequently, within New Business the strategic decision was made to establish a functional group to focus on this. Subsequently, the choice was made that something had to be done there (strategic choice to set up a division within New Business that would deal with this). Then the question was: how should this be addressed? Several options have been considered for this:

1. Build it ourselves (platform, proposition, hardware, etc.). However, there was zero expertise or ideas regarding how to do that, so this was not an option. This would also mean that you have to build and maintain a mobile app, service, add and remove devices, set up a help desk for people with problems, set up a distribution chain, have hardware suppliers, etc.
2. Sourcing and integrating a large part in a landscape. Experience, however, taught: it is a large corporate and those core systems have already established their roadmap for the next 10 years. So the eventual service could not be available until 2020. It was then concluded that this was also not a feasible option.
3. Build a new organization, but with KPN branding. In this organization all that connected home expertise is sourced from another party and offered via a white-labeled concept.

There is no sticker on it yet, we put a KPN sticker on it. For this, there were two options to deliver the proposition (including hardware, software, back-end, mobile app, etc.): AT&T and Deutsche Telecom (DT). Whereas AT&T had done that before, DT had not. In the end, DT was chosen. You can see DT as the center of the Ecosystem. KPN was on a different side of the Ecosystem and has customer contact.

In concrete terms, this means that DT provides: the app, mobile watch app, a large part of all devices to be connected, integrations (e.g. software for motion sensors in the system must be certified. This is important for an automatic door lock, for example). They provide the back-end (communication between the different homes with the service and the internet / app in a secure way). They provide a kind of hub to integrate the functions of the home appliances. They provide support (not help desk but 2nd and 3rd line support, e.g. for hardware problems). They offer a piece of marketing materials, the whole vision piece: where does it go, testing new propositions, certification processes, they all offer. When KPN receives it, it is already fully tested, piloted with large users, and does virtually only require transition to the Netherlands and integration in a new mobile application.

To give an example of what has recently been rolled out, an over-the-air update mechanism has been created that can update sensors that are interconnected in a kind of IoT network. If, for example, a bug is found in the door / window contact, which means that you can break in, your proposition is undermined because it is no longer safe. You want to be able to update your software in that little device. This is tricky because network constraints from IoT networks allow you to send information only to a very limited extent. With the update they could adjust the bits and bytes. In a perfect lab that might work, but in a home with all kinds of Wi-Fi networks, the connection is constantly disrupted. This breaks the sensor. You want to get all the bugs out before you put the product on the market. The Connected Home proposition (relating to *safety & security* and *energy management* domains) was launched in 2015. Since then, a number of new services have been added. In short, KPN is the party that is in contact with the customer, and DT supplies the rest.

Safety & security domain

To set up the security proposition, we partnered with a security provider: Trigion. Trigion has a physically manned control room with which they can keep an eye on everything (including companies). They also wanted to offer services to consumers. A Technical integration and service contract with that party was set up. With the alarm going off in your house, not only your lights will start flashing red and your smoke alarm will start beeping, there will also be a signal going to the emergency room and a security guard is sent to your house to check. That is an end-to-end security proposition. You're automatically called by the emergency room with a notification of an alarm detection and the request to take action or not. This was the initial Ecosystem structure of KPN SmartLife.

Energy management domain

After that the service was expanded to the energy management domain. This included smart radiator heads: attachments for ordinary, existing radiators, which are connected via USB and can be controlled. A sensor in the attachment measures the temperature and was connected to a central thermostat. This allows for temperature control per separate room.

Expansion of the service

The prices of such a package with a few sensors and hub are easily 300 - 400 euros. It is however questionable whether a consumer is willing to pay for it. It is possible; for Toon or Nest you'll pay a high price as well, but that's because it is included in your energy contract. Such services could not be integrated with the connectivity service because of the KPN system and the resistance. The system was stable, but there were many weird bugs that still occurred. It was just not quite the Apple quality. Collaboration with a utility company has been discussed (test integration with Toon was realized) but the question then is: where does the data lie, and who 'owns' the consumer? Is it an energy or telecom consumer? Consumer ownership, that's where it went wrong. Then if you don't market it and it is quite pricey, the service is adopted rather slowly. Then it was decided to keep the service running to gain more experience. That is the status ever since. Because they have a contract with DT, they do get updates and you can connect more and more devices, but there is no real

market anymore. You could imagine that the white label would have a temporary status, and if it proves itself, KPN can offer it independently (at least at the front side, to the customer). But that is not yet the case. It was an interesting project, but there are many forces at work to make such a thing successful. Even though the idea is very good, you have to look very carefully at what your market is expecting. Marketing could have been better.

Achmea Homies

Achmea homies: joint venture between Accenture and Achmea to offer a connected home service product. The question was: why is it this service interesting for an insurer? Because they know that something is happening within your house, they can do something faster. In particular in the damage domain: fire, theft, water damage (the largest claim is water or burglary). Making a proposition and linking it to insurance can ensure that the price for the consumer is lower than for the other providers. Homies is actually an IoT device that monitors your house. It works with WhatsApp. If something goes wrong (fire, burglary) you can decide who the message is sent to (neighbors, family, etc.). This means there is no dependence on another Ecosystem partner. It is important to set up a good IoT device and to design the service model that way.

Behome

In Belgium, they have made a proposition with an insurer, called Behome. This is similar to Achmea Homies: IoT device in your house. A kind of service that turns out to be working is a subscription (insurance, telephony, gas, light, water) of which the price can be reduced thanks to an IoT device. Pushing a new type of offering for devices is very difficult. This is mainly because of the price. You have to include the hardware in your house. This is expensive. Once you have it, you can easily buy extra. The issue, however, is with crossing the threshold.

Technology

What's interesting: at that time (2016) there was a lot of experimental technology and now there is more mainstream technology. Now, with the rollout of 5G for IoT devices, and LORA1, and all sorts of other technologies, the business case is very different. Upfront investment for the corporate and end customer is already a lot more interesting than back then. To roll out the next service, you must first do a market research. This can be tricky. Healthcare in America is a much larger market than here. Take a good look at which markets are served and what residents are expecting. This can be done by quantitative analysis and panel agencies.

Research focus

Generic research on *“what does it mean for an organization?”* (broader than just KPN) is very useful. Almost every company looks at Ecosystems. Every company knows they have to partner up. However, there’s actually few literature on what is needed for this. Then you should make a specification: IoT-like Ecosystems and what does that mean? But basically, there are always generic functions that all companies in Ecosystems do and need. What are the functions (APIs, integration, etc.)? And then there are a number of specific functions within your Ecosystem type (IoT: Smart Home is an example). For a next step you can say: What does KPN have now, and what do you miss? How could you do that? Maybe not the current Ecosystem but a new one. What would be needed and what would it yield for KPN? What is the missed opportunity now, and is that something that could be interesting? What does KPN need to change in its SmartLife offering to make it Business Model viable? Those questions are relevant. Then, what kind of company are you? Are you still a telecom provider or a very different type of company? And if you are a different company, what does the organization of your company look like?

VII.G: Product Manager at BeNext Smart Home

Introduction

BeNext was founded in 2007, and I started a graduation project here in 2008. Back then only two people were working here. As a graduation assignment for my electrical engineering education I had to realize the ideas that were there and show how we could possibly let it work in practice. I made a link between a few products and a system that you can read and control from a website. That was very interesting; I learned a lot from it. Now we have changed a little as a company. We were really a development company that made products and sold them. Our director could offer that to both the consumer and business market. It turned out to be difficult to sell single products. The consumer market is very different from the business market; it requires other qualities as a company. The business market always felt good. We did have a web shop we could serve consumers with but found out that BeNext is really good at creating a product and working with business partners on a larger scale. Then you only need to explain it once, and the client can install it one hundred or five hundred times. That works better and that is how we made the switch to the business market in 2013-2014. I took the role of project manager there. My colleague and director does the sales, and then passes it on to me. Then the idea is worked out further; what does the customer actually need, do the expectations match what is in the quotation, and what will need to be implemented? Because I have background knowledge in technology, I can certainly keep up and I have had to train myself towards project leadership: what is expected of you then? How can you position yourself and your company? What we have noticed is that all customers are coming back. We work with the construction sector: BAM or Heijmans. Those are big customers; they have five to ten large offices in the Netherlands. They must remain enthusiastic about you for future projects. We've focused on that, and that worked out well because all are coming back. First it was pilot projects with 10-25 homes; now it is larger projects with 50-150 homes and apartment complexes. We have made our own network larger, because we can say we work together with BAM and we have realized more than a thousand homes with them and have been able to show something there. That has put us on the map.

Focus

Our focus lies with energy monitoring and not so much with making a home completely smart. BeNext's mission is to create more awareness among residents. Through these insights you create this awareness with residents, but also with the housing cooperation and with the contractor. We work with zero on the meter homes, which need to generate as much energy as they use. That is a nice concept in theory, but sometimes difficult in practice. A family with five children does not match the standard that we have calculated. How do we ensure that that family does not call monthly about high energy bills? We have made tools to make that clear. I am now the technical operational manager. I'm the lead of those who make software and hardware, but also do the project implementation. We have had good years in the past two years and we want to maintain our growth.

Products and services

Our broad range of products offers something extra for contractors: we can offer energy solutions but could expand to other services. For example, we work with an insurance company. As soon as the smoke alarm goes off, people receive a message on their phone and can share this with neighbors, for example. Achmea Homies is also a party in this market. This service is focused on the consumer side. We did not focus on that market because we have a better fit with the business market. We prefer to do 500 homes over 10 homes with a very complete package. We also work with an installer; so installation by the consumers is not required anymore. Achmea Homies does let consumers do the installation. Then you need completely different competencies as an organization. Our product is used by consumers, but the installation does not always have to be done by the resident themselves. The majority of people simply wants to control the sun blinds with an app and not connect anything in the meter cupboard to arrange that. Only the hobbyists find that interesting; most of them don't

feel like it or don't know it, or find it exciting to do. You also need someone that provides service if it doesn't work; so they can come and fix it, just like with your central heating boiler. All consumers want is to have a thermostat that works. If it doesn't work, they should be able to call.

Housing associations often have their own service party. If not, it is outsourced to the contractor. We are a bit on the sidelines, but we often show it when it's not right. We are often the bogeyman there. If a property has not generated any energy in the last month; maybe someone has to come and check it. We report but do little to coordinate installers. We are active during delivery, but not afterwards. If a large contractor has around 15 people, you don't really want to use your own man for that. That goes very well; sometimes you have to send someone who gives a little more explanation and, for example, do the installation for house together. Then the other houses can be done independently.

Project with Nationale Nederlanden

We did a project with Nationale Nederlanden that wanted something with smoke detectors and security. That is actually comparable to Achmea Homies. About three years ago a test was run with ten houses. They were serious about it; there was a special team behind it that had to contribute something: this is a new possibility to offer insurance; what is needed for that? That was their job. For us: how are you going to connect the systems? An alarm system was then connected to Securitas. This security provider has national coverage, which was very important to Nationale Nederlanden. The insurance provider received a notification if an alarm went off. We wrote a process that includes steps that needed to be followed for each of the possible alarm notifications. Also, we thought about how you could offer something to the residents themselves in the event of a false alarm notification. If an alarm is triggered in a house, an insurance provider wants to know what went down in that home. Has there indeed been smoke damage? They want to know that immediately and not after three months (apparently that often happens). Now, for example, they only get a message after a few months: we had a fire in the house a few months ago and now our TV or dishwasher no longer works. Things like that happen too; these are examples from the insurance provider’s side. You must have a link with a technology that generates alarm notifications, but reporting with the security provider is perhaps even more important. You don't have to install sensors everywhere in your entire house; one or two is sufficient. They are linked to each other. We also had a motion detector. A discussion was: what will you do with the data? We receive all kinds of data that is owned by the resident and not by Nationale Nederlanden or us. Then you have to coordinate well whether or not you can process that data and analyze it. Everything with data is always very interesting for insurance providers or similar parties, but in this case they had no specific plan as to what they were going to do with it. That would have been the second or third phase, which was never initiated.

Data

We did share data once, but I think that concerned how often a smoke alarm had gone off. That of course never happens in a pilot, so that had to be tested. Has the alarm notification subsequently been sent to the security provider (Securitas) properly? How did they process this? That data is more valuable than, for example, the temperature data of all the different houses. They had ideas about that as well (if you see the temperature rise rapidly, without the smoke alarm going off, you can see that something seems not right in the home). Analyzing data is not difficult, but you have to think about what you want to achieve with it. If you are going to notify the resident that the temperature is higher in the home; what should they do with it? This could lead to privacy issues; to what extent does the resident enjoy being watched? Insurance providers find big data very interesting. Nationale Nederlanden, for example, has a service where devices in cars collect data, and a discount on insurance premiums is given (business market). They have always been interested in data. They also know the risk; you have to comply with GDPR and not everyone likes it when you watch over their

shoulders; even with a data backlog of one day. For example, you can immediately see it when someone is on vacation. Privacy infringement are therefore an issue. Then it was discussed to make the service anonymous. That is not exciting, but then the question is what is the value of the data? For example, you will have data at the level of cities: everything in The Hague has 10% more fire alarms than in Amsterdam. They try to get the data and do something with it. Then they will try to optimize processes so that, for example, a security provider can be on site faster to prevent damage. Together with data analyst you could come up with new ideas, which you could then validate. You could for instance check if it has added value to send someone immediately when a smoke alarm goes off for more than five minutes. You can do that type of action with a data analysis. There were ideas about that, but it didn't work out. In the end, the project did not continue, because high costs were involved. Running the service involves costs, and people must take out insurance which should actually be lower than the standard insurance. At the same time, the insurance provider has to ensure that cost reduction is indeed achieved due to the service.

With Syntrus Achmea, more data is being analyzed by us because they do not have the data analysts and ask a more specific question: what is the average temperature of the house? We can send a report of that. Or the number of alarm notifications in the past period. Then we do not have to send the data; that would be hundreds of MBs of data. You can no longer process that with an Excel file; you need tools for it. That is not a problem if you are a data analyst, but if you do not understand it then it will not work. The insurance provider wants to know what is happening, but do not want to analyze the data themselves. They are partly data owner, because they have coordinated this with the residents. Therefore, they can request and process it. In this phase, however, they still request reports at the level of a neighborhood. The insurance provider is good at insurance and should be: management of your real estate. They have development money to better manage that, to get a feel for it and to renovate those houses, and to see what the effect is: how do the residents actually respond? They mainly look at security (smoke detectors and alarm systems) but I have also seen a project where they monitor air quality. If you have data as a property manager and can respond to complaints from residents. For example, if the extractor hood starts to make noise after five minutes, it does not manage to get everything away successfully.

Energy management

We measure energy consumption because we want to know how much is generated during the day. The trick is that it is generated and you use a part of it, and the rest is delivered back to the net. You can see nicely what is being delivered back and what you are using, but you cannot see what has already been used in your home. We take care of that part. If 500 KWh is generated, of which my TV, fridge etc. used 300, then the remaining 200 will be returned. In this way you make the residents aware of what they actually use. We have tried this per household appliance, but that has little added value it turns out. Then we would take the role of energy coach; then it is interesting for residents. Some residents find it interesting, but most of them do not. For example, we are also active in social rent projects. Then you can put it down nicely in Dutch and English, but they may still not get it. It only works if you send an energy coach. This dishwasher still works, but uses a lot of power

Collaboration with security provider

For our collaboration with Nationale Nederlanden, a connection was made with Securitas. I think those were email notifications. That was easier, but it is also possible to manage at API level. If smoke is detected, the residents receive a notification, and we do as well. All data comes to us. The resident is informed by a push message on the telephone and email. And an email is sent to the security provider with the details: which house it is, what is the report, and the priority (how quickly must be responded). Agreements have been made about this. Then they knew how quickly they had to deal with it. They had a system that handled that and a call center that attempted calling the residents. If

they would not answer, they called two other people. If nobody answered, they would send a security guard. This included automatic invoicing; per case there were costs involved if they had to come over. The other side is that there would be a security guard at the door who comes to see if anything can be saved. This security provider operated nationwide. There was also a fire alarm; then they could immediately call the emergency number. This way, there is one channel that handles everything; and the residents themselves also receive a call to verify if there really is a fire. For this there was a process in place: if you did not respond within so many minutes, the fire brigade would be sent. The service had never been fully tested. It had been around for six months and they tested it themselves, but within that period there had been no real fire alarm or burglary. That is of course the tricky thing about pilots. You actually do not want it to happen, but if it does, you want it to happen well. The fire department also has a stake in it; they don't want to be sent to the same house every week for a false report. It must be properly managed so that not too many false reports come in.

Risk of Achmea Homies

The Homies service also entails risk. If there is a fire, the neighbors get a notification and may tend to extinguish it themselves; even if this leads to a dangerous situation that should be handled by emergency services. From the project we did with the insurance provider, this was also presented as an issue. How do you deal with that? You don't want to endanger people. Then as an insurance company you will get in conflict with other insurance policies, such as health insurance or third-party insurance. They wanted to bring a bit of education. For example, people were instructed not to take too much risk and to put their own safety first. If you do not trust it, you must call 112 so the emergency services can solve it. Now also, when a smoke alarm goes off, the neighbors can hear it. That is already the case. The difference of the Homies service is that an entire block will be informed.

Establishment of partnerships

How do partnerships emerge? An insurer or other party often comes to us, or we have come across them in a project. This way you come together with an idea and you find out which parties fit in with the way of working. There are also parties that do not match your requests. You can offer a nice home automation system, but the client could have the requirement that it should not cost more than a thousand euros per house. This is not only financial, but also regarding the options. We currently cannot create a Whatsapp group ourselves as is the case with Homies. We have to develop that ourselves. That means that an investment has to be made, and for ten houses you will not do that unless a budget is made available for it. These are often the first phases of such a project: how can we make the integrations together without creating too large / expensive systems? And you have many different service parties: large and small-scale security parties that only do neighborhoods. It has to fit in the area you're working on. Service management is also relevant. For example, for a heat pump you want one person who comes by every year. If different people come by multiple times a year, it is not pleasant for the customer, the housing association or insurer and is inefficient. That is often the starting process: how do you get the right people together?

A security provider would benefit more from sending a security guard over than immediately calling in emergency services, while an insurer wants to minimize damage costs. This must be carefully considered. And if you link multiple systems together, the providers of these systems can be competitors of each other. Some parties do not want to collaborate with certain smart home platforms; so they are not open for cooperation if the platform is not in line with their wishes. That is part of the first step in finding partnerships. Strategy: companies want to make a profit and have their own agenda. This must be submitted and contractually arranged. For example, by allowing the security provider the first alarm notification, but if no response is received after three minutes, contact must be made with the emergency services. You should also be able to test that; the security provider must then be able to prove that they have done so. You must be able to look back at the data: this is indeed done. If of fifty reports, forty are resolved within three minutes and ten after five

minutes; how is that possible? Was the telephone busy, or did something else happen? During pilots you can still do it in good faith, but in reality, it must be contractually arranged. We do not arrange alignment between partners; that is what the customer organizes. That party is responsible for coordinating the partners. The parties may have their own jurists who draft the contract, but we usually see that an demand is sent to parties A, B and C, who can then propose how they can work together in contract form. That then needs to be tested. Often these types of relationships and contracts remain between two parties; even if there are many links between different parties in the Ecosystem.

Another project at Dura Vermeer also has something to do with Smart Living: Iris. We participated in this for two years. They had the idea to make a smart home, and a pilot home as a concept was equipped with the technologies. This also included security. You notice that in a partnership with large parties, not everything can be contracted to each other; you do not always agree and a partnership can suddenly disappear. You have to find the right partners, but they also have to have the willingness and the courage to sign to get this together.

Subscriptions

We have a monthly fee for monitoring because we have to save the data. There are three types of subscription. The first is only saving data (the resident can view it via the portal), the second is the basic subscription, where a service portal is also set up for the service party or contractor or corporation who is then shown per project how things are progressing and therefore can review the data themselves. Plus, we run a report on that project every month with, for example, energy consumption of the heat pump or ventilation, and that is compared to solar panel output. Then you can see: how efficient are the houses? If you compare that at neighborhood level, you will see that several homes perform differently on household energy use. With the final type of subscription, we ensure that, in the event of a malfunction, an installer is sent to fix it. The reports are also more detailed; for example, the efficiency of the heat pump is also included.

Dependability and precautions

We also notice that if we do the monitoring, everyone is completely dependent on our platform to receive the notification. This also applies to the hardware in the home. For that you must make agreements in advance: you must be able to deliver the product (or equivalent) for at least ten years. That is not even about the costs, but about the fact that you *can* deliver it. This also applies to the service. You can subscribe to a service; but what if one of the parties drops out? How is it arranged then? What happens to the system? Certain measures are present for parties who drop out; this ensures that the services can still be guaranteed for a certain period. Then, for example, there is half a year to get the service up and running. Agreements like this are often made: we save a little money to keep the server up and running for another six months. If by then we still haven't managed to fix it, the hardware must be replaced with a different platform. These are risks that you must consider in advance. This also applies to large parties. BAM can have a hard time in a certain period because they have not correctly calculated a project in another department. Consider Imtech, for example. Certain departments are eventually taken over again, but with a restart certain choices are made regarding which projects will continue and which will not.

VII.H: Co-founder of Achmea Homies and Director Ecosystems & Strategy at INNOPAY

Introduction

At INNOPAY we do a lot of work on Ecosystems; projects such as iDEAL, iSHARE, iDIN. We help large consortia to shape a non-competitive domain. In this domain, data or functionalities can be a shared between participants under a standardized set of agreements. INNOPAY started with iDEAL and establishes this type of agreement consortia in different sectors, e.g. united public transport companies and the logistics sector. We try to shape the non-competitive domain with stakeholders. I hear you talking about value exchanges between actors. What I see is that the point is that there is trust among all participants that cooperation leads to an 'increased size of the cake. Participants value this, even though they do not yet know upfront what piece of the cake they will get. It is very difficult to predict in advance how to develop a working proposition, but because you think the cake is getting bigger is a reason to create an Ecosystem. A second motivation that I see is the fear that if parties do not cooperate, there will be a large (American) platform that will draw all the value in the Ecosystem towards itself. That would be a winner-takes-all party. The fear of this ensures that all parties are dedicated to keeping such parties out.

Request from Achmea

Achmea wanted to do something in living, which had to be innovative. Then we composed an Accenture team with which we first started exploring what was going on. We quickly arrived at a number of points. The number of claims in disadvantaged neighborhoods is significantly higher than in non-disadvantaged neighborhoods. We saw the trend of WhatsApp neighboring groups. Connected home was also a trend that triggered people. At some point the idea came up: what if we bring those things together? That resulted in the Homies concept. We wanted to link simple equipment with the power of the neighborhood so that you don't need an expensive security center and it can become a proposition for low income groups. It was still expensive for consumers, but we could make cheap enough so that housing corporations could co-fund it, and we could afford it from the reduced claims they had on their homes. That was our case. Then we went looking for how it should be arranged, which equipment was needed and which housing corporations. This is how it was developed step by step. At a certain point there was a delay because we opted for too high-end equipment. The equipment was good; it was one device that could detect multiple events. That is why it was fairly cheap. However, it was still a bit too innovative and not fully developed yet. Currently, that equipment is fully developed, but Homies has switched to a Chinese supplier. Although that took us a lot of time, the concept of using the neighborhood as a safety net and improving social cohesion for more security in the home was very powerful.

KPN SmartLife

At that time we also looked at KPN. they wanted customers to be able to do everything from one app. That was their platform strategy. We did not really believe that at the time, because many parties were pursuing the same strategy. In addition, it was relatively expensive in terms of equipment and additional services that had to be arranged for the security. We saw quite a few hurdles. If we wanted to do something for claims, we had to focus on low income groups, and KPN's service is not suitable for that at all. You have to go through some difficult steps to get the benefit of being able to do it from one app. It has never become clear to me why consumers would want to do it from one app?

Achmea Homies: two propositions

At a given moment two propositions were set up. The first runs through housing corporations. The second: not only people who rent through a housing corporation live in the neighborhoods in which

we operate, but also people who own a house. They also have the option to purchase the Homies service. That is why we have set up that proposition. The key driver was to get the network in those neighborhoods as dense as possible, so that there were always enough neighbors where that app notification could go. We did this in various ways. You could also participate without having the equipment. A Homie was someone who actually owned the Homies service. A Sammie was someone who had registered for the network but had no device. A Mattie was someone who lived together with a Homie; who of course also had to be in the App group. The core of the proposition was that we had defined the roles very well, and that those roles were in the platform. There was a logic for how the notifications were then sent in those different circles.

For the corporation proposition there was no discount for the home insurance and home contents insurance. The corporations were promised that we would help to measure how the service had an impact on the claims. If it had enough impact, they received a discount from the insurer on their total portfolio. Parallel to this, we were occupied with home content insurance policies for individuals (the second proposition). That is a difficult case as it was about euros per month. That is not what people do it for primarily. They do it for safety. The feeling that your neighbors pay attention is very important in those neighborhoods. Social cohesion has decreased by, among others, migrants. People have become quite alienated from each other in disadvantaged neighborhoods. The feeling that you connect those people more to each other was a motivating reason for many. I have not yet seen that the service is acquired for a discount on insurance premiums. Interpolis is currently trying again with Toon (Thuiswacht). If they are unable to do so again, they are left with a lot of equipment; they all bought this in advance, and the service just doesn't work. I think it is a mistake that the insurer must buy and resell the equipment. That equipment does not need to be part of the service offering by insurance providers; consumers can choose the equipment for themselves. The insurer should think about which proposition / platform they want to build around it. Interpolis insures approximately half the Netherlands. It makes no sense to focus on people who happen to have a Toon thermostat. The many-to-many thought in such an ecosystem has disappeared. There is an open API on the Nest smoke detector. You can build a proposition in which you, as an insurer, require the client's consent. The customer logs in via his Google credentials, and gives consent to view the smoke detector data. Then the insurer knows that the resident has a smoke detector, and that it works. The insurer can give a discount based on that. That is very simple; you can include it into a certain flow of user experience. But you don't have to do much else with that. You do not have to make difficult partner agreements and data processing agreements, etc. If you do that, you are completely tied together, and nothing happens. The corporates make large packs of paper with processing agreements between the various parties. They then look into the conditions that a customer signs; are these included? If yes, then it is covered. But the customer does not know what is going on. He or she does not read it and does not know what is going on. They then think they are legally covered. Nowadays it doesn't work that way anymore. The customer must be aware of what he or she has said yes to. It doesn't work that way; with difficult terms and conditions. I think such a consent flow is much more logical; then you also do not need bilateral agreements. If you do it smart, you will soon have a Google API and a number of other open APIs. Then you can link multiple smoke detectors to your proposition, and the customer can choose the one they prefer. The consumer chooses what he or she wants and will not purchase it via the Interpolis website.

False notifications

False notifications have also been a major problem at the start. With false notifications the value of the proposition to consumers decreases rapidly. People lose confidence very quickly. On the other hand; if there has been no report for too long, they quickly lose confidence as well; does the device still work? That is a difficult one. This is an issue especially with safety propositions. From the data we concluded that people are very inclined to purchase safety equipment after the commission of a burglary in their house. A month after the burglary, however, they have already forgotten. It is a huge peak – especially if there has been something in the news – but after that the tendency to

purchase safety equipment decreases very quickly. That is actually also the case with notifications from the service. Consumers are enthusiastic in the beginning, but after a month they have already forgotten that they have it. Consumers also don't really want to be reminded of it continuously. What you do with that, is constantly fueling the feeling of insecurity. I find that the difficult thing about safety propositions. Consumers are often aware of something going wrong. Then they also tend to say: I don't want to participate anymore; I no longer give the insurer permission to have insight into my data.

Data

The insurer does not yet know exactly what they want with the consumer data. Everyone is talking about advanced data; such as data about when someone is home. Around the concept of smoke detectors, one of the most important discriminatory factors for damage is whether you have a smoke detector or not, and if it works. The second is especially important. Insurers occasionally give away smoke detectors. People install it, and at some point it starts going off because the batteries need to be replaced. It then often takes at least two years for the battery to be replaced. An early notification of a fire can ensure that the average claim burden is reduced by approximately seventy percent. The next step of connecting the smoke detector (i.e. forwarding notifications when you are not at home), is actually very small. The first step Is knowing if a smoke detector works; people are often not really concerned with that. Nowadays, knowing whether the smoke detector works is fairly easy. Just having those data points is relevant. If someone doesn't replace their battery, you can send them a message: we see that it takes too long to replace the battery, so your insurance premium goes up by a few euros a month. You give them a fine. That motivates people to turn it back on quickly. Few people are thinking of these simple data points. People tend to think big when it comes to the use of data: water leaks, intrusion equipment, connected smoke detectors when you are not at home, or service propositions at the back. But the simple story; what it can mean if equipment is connected are often not yet seen. I also think that there is still far too little data. For a typical up-to-date analysis you need about fifty thousand houses that you track for one year. This must include both a group that does and does not own the service. This way you can monitor in different zip code areas and distinguish whether it is really true what was claimed. Fewer than fifty thousand services are currently included in the proposition.

Reduced insurance premiums

It is possible to calculate how the reduction in insurance claims can be translated into a reduction of the insurance premium. You then arrive at a maximum of around ten euros discount per month. That is not a small amount, but it is also not what many people get out of bed for. It is mainly the low-income groups that really benefit. That is of course a major ethical issue; are you going to offer this? People who have money can decide not to give up their data. People who don't have the money *have* to share their data. They must give up their privacy in order to receive that discount. You can see this with more of these value-driven propositions: you can buy privacy if you pack it in a discount. Insurance is a solidarity product. The more you differentiate, the less solidarity you have. For health insurance, so an insurer cannot select, not know who you are, and not ask what kind of diseases you have. There are a few rules for life insurance, but for damage not at all. There is a positive attitude towards collecting as much data as possible so that the risks can be removed from the market, but those with the high risks remain, and they will soon have to pay two or three times as much. That is of course a spiral: if connected propositions start running, it is a spiral that you as a society will no longer be able to get out of. Then you get uninsurable groups. This is an interesting intellectual discussion; but the low-income groups are not so concerned with this themselves.

The risk of people putting themselves in danger

When registering for the Homies service, you receive instructions: what do you do in different situations? There were training sessions to make people aware of the steps you can take when such situations occur. There were certain principles for this. The police also communicate about this. There is consensus on how to approach this; it has also been validated that this works.

Use of data by emergency services and security provider

Police now only respond to emergency call (112) reports. They prioritize this based on the number of people who have called. If one old woman sees something suspicious, this weighs less heavily than when ten people call. This data is interesting. The combination of, for example, data about a telephone call, an alarm, and activity in a WhatsApp group in the neighborhood is relevant for giving priority to reports. This way they no longer have to respond one to one to notifications but can see this in a big data context. A fire department is also looking for this type of data. For a fire brigade, it is not immediately a reason to pull out if a smoke alarm has been triggered. If several smoke detectors go off and several people call, several cars are sent immediately. They are also taking steps to think about how they can use big data to better estimate reports. You should not reason too much one on one (a smoke alarm goes off, so we go there). In your case this is actually centralized and fully in the hands of the security provider. They can prioritize based on this, but of course have a commercial interest themselves. The more often they are deployed, the better it is for their business case. I think these are ineffective propositions. A security guard is deployed once per eighteen months for each home. For that, consumers have to pay a high monthly fee to the security provider.

Other propositions

There are also propositions where you have a report in an app, and you have to give consent at that moment for a security guard to come by. At that moment you can pay. In my opinion, this is ineffective as well. What if I'm not near my phone for fifteen minutes? How does it work then? I believe in hiring a security guard from the security provider who drives around every night. That way there is an extra pair of eyes on a neighborhood. I have never understood the value of security providers responding to connected notifications. It takes a long time before they arrive. If it is serious then they call the fire department themselves. I understand that an insurance company wants a broad proposition; they are looking for new revenue models. The insurance company receives a percentage of the fee from the security provider. Achmea, for example, also has to look for new revenue models, because the insurance market is becoming smaller and smaller; there is more and more competition. They are therefore looking for these kinds of services. I see more value in roadside assistance in case of a car breakdown than in such a security service. I think that people who have just been burgled will purchase such a service. After acquiring the service, there is a good chance that they will forget to unsubscribe in the months after; when the safe feeling has returned, and they do not feel the need for having the service anymore. There have been investigations in the US. After a terrorist attack, the connected home security equipment increases considerably in volume during the first few weeks. After that, demand decreases rapidly. The question then is: what does a terrorist attack have to do with securing a house? It is the general feeling of safety that people respond to. I think Trigion experiences certain peaks in demand (based on news items for example). Later, a number of people unsubscribe from the service, but many will just hang around. I think that's the way they grow. Safety is a strange concept; it is really about feeling. And that feeling is influenced by what happens in the news.

VII.I: Business Director of the Alarm Service Center at Trigion

KPN SmartLife

I am the business director of the alarm service center and the corresponding infrastructure that we use. We started having discussions with KPN. We were not the first party they contacted but they ended up with us to see if we could help with the development of the SmartLife concept, which then already had a great part of the technology in a road map. We entered during the second part of the conversation. Then other things came to light that we did not yet have a clear view on. Matters such as: what functionalities does a system have to meet, apart from the customer need (which we have no focus on), we looked at what to deliver and how. I think the classical mistake was made to first select the hardware and then look at what you can do with it. That happens often, but I think it is a wrong choice. Subsequently a lot of time and effort was put into making the hardware fit for its tasks. I don't believe in it. I think that's one of the reasons why it was not rolled out in the market easily. There was a difficult and complex Ecosystem structure with numerous actors. It became more difficult in terms of demarcation which actor was responsible for what. What I found myself was that the number of KPN people versus the number of Accenture people was out of balance. Accenture was in the lead, whereas I think the owner must be in the lead. Before you know it, you will get all kinds of nice to haves, whereas I think you should have first started with a minimum viable product and test that in the market, so you can validate the assumptions you made for the market consultation. I think we have a different picture on the market than SmartLife. We think: safety is a product that people care about but do not invest in massively. Such a product has a chance of success, but then you must have a broader product portfolio. So that must be applicable in care, but also in comfort, ease and must work intuitively and easily. The hardware, however, was chosen based on strategic considerations. That must be dealt with, but as far as I am concerned that was the biggest hurdle for success. If you then have no internal owners for the service, it is directed by developers. We have developers as well; they just want to do development. They are not interested in bringing the concept to the market. It yields great products, but those products may not be tailored to the needs of the market. I think the differences in interpretation led to the fact that the market rollout was not easy. If you take KPN as a case, you will notice that they have an advantage over the rest of the world; at least looking at the Netherlands. They have a huge installed base and customer reach. If KPN fails to bring a good product like this to the market, nobody can. It is a reliable party that is trusted by the customer. All necessary conditions are present. Then I think the service is made too complex, which makes it difficult for people to absorb what the product entails. Then it seems as though marketing wise you use the wrong triggers to get people to buy this product. I believe in enabling. I do not see that Trigion has contradictions with an insurer; on the contrary. I think it is more a collaboration rather than being in each other's market. Others may see this as a threshold.

Open API's

I support the idea to be able to connect different devices via an open API, leaving the choice of hardware to customers. That is a world that goes beyond us. You can try to shield that with a Chinese wall, but then you will have a disadvantaged position, I think. Also, I do not believe that the revenue model is in the supply of hardware. The market is also developing. On the other hand, I think an open API is tricky. IoT is insecure by design. That is not something you want to convey. As a supplier I would therefore prefer to deliver a product to the customer: the central unit. This unit must be intelligent and able to communicate with devices by communication protocols (Zigbee, Z-wave). You have this equipment in two areas: (1) the equipment which I, as supplier (KPN / Trigion), support. You can call the help desk for this. (2) devices that are not on the white list, I want to help with that but I cannot give any guarantees. There will always be more devices; but all those devices do have generic characteristics. You pair them in a certain way, they have a protocol, a certain signal. I can connect this with a not-known device. For example, I support a Fibaro or Aotec. If someone has

something else, we can consider helping to help someone. There will always be more devices. If you want to link a Google Home or Alexa, that is a constantly moving market. In a whitelist you can say: these devices I support functionally. This leaves the choice for hardware with the customer. The customer is not always the ignorant old person who says: I want it but I have no idea what I have bought. Many customers are very self-supportive. By giving freedom, you also give them space. I think the Western European market is primarily aimed at people who can or want to do it themselves. You have to give those people the space. If you do not do that, and determine what hardware people get, then that is a threshold that customers encounter. If the customer misses out on certain functionalities, he or she can say: then I have no need for the service at all. I believe in open structures and APIs, but you have to offer a certain form of security because, with customers, there is also naivety. "You cannot continue if you do not click". The customer clicks but has no idea what he or she has said yes to. Many people need to share a lot about their social life on social media. If you say "it is a safe system"; safe is a term with multiple explanations. Trigion looks at it in a stricter way than the average consumer. A customer looks at ease of use, Trigion looks at liability and safety. I don't want to open Pandora's box. I think that as a supplier you have a certain image where the customer can expect that the professionals have thought about it. The customer does not think about safety. They assume it is safe because it is supplied by parties for whom it is their business. When I go to the Action store and the things I buy break, I will probably not return it. People expect that with that price-performance ratio. If you take an A-brand service in your house, you assume that it works. The moment it is unsafe, it comes back incredibly hard for us. That will continue to haunt you. At the front side you have to arrange that very well. Some politicians say that you have to come up with regulations for IoT. I say: fine, but we already have a few billion devices that don't have it. We might think of a solution in the future. However, it is similar to medical equipment. Because of the life cycle of that type of equipment (if it is not automatically embedded that updates are possible), then it is safe when it is delivered. After a year or two, however, it is no longer safe. I cannot change that device, firmware or software. It was not built for that. The equipment is therefore always unsafe. With that knowledge you have to build something in between that takes care of customer safety. That could be the USP that KPN delivers in its smart box, or in a hub. That way, freedom remains with the customer. The hardware then only needs to be able to communicate and pair.

Testing

You can test in a laboratory environment. You can run a trial with 100 households. People are just not calibrated. The next 100 are different again. You have to think a lot more about how you deal with that. I can't manage to let people take certain actions in different scenarios. You have a production standard that, up to a degree, you can test. Then it's not about the device, but its use. A motion detector in a corridor at school gives many reports during the day; that says nothing about the detector. You have to include logic with if / then reasoning. You can do that very well. I receive approximately 450,000 reports per day at my control room. Of these, an average of 2000-3000 are shown to the operator. This is because the computer looks at if / then reasoning and that leads to certain choices. I cannot prevent reports from being made. I can only learn from it and have fitting logic that says: we are going to do it this way.

False notifications

Before a security guard is sent you have a technical and human handling. The operators see the reports and assess them. When I look at SmartLife, we have largely replaced the operator with the control room itself. The customer receives notifications via push / email / texts. He or she gets the false notifications himself and can act. That is a solution; we do not want to forward false notifications to the police. We said: that is not enough. The private individual is not a professional care provider. You don't want anyone going on vacation and not receiving the notifications. The ecosystem must be closed. That is why we started working with SmartLife; we only support these

types of systems if the ecosystem closes. Notifications; validated; first presented to users, but if they do not respond, the reports should come out as a sort of safety net option with a professional service provider. The action can then be: I send a security guard. This is a final action. You can also try: do I have other telephone numbers or can I call again? I can interpret the reports; is it a single notification? I see that the alarm system is switched on; and the front door gives an alarm. Other sensors in the house only do not give an alarm. Then it looks like someone has left and caused an alarm. Do I have to worry and send emergency services to it? This way, you develop a professional interpretation. If all the sensors do go off, I will send someone. Sending a security guard is actually an intermediate phase. My feeling says: something could be wrong, but I am not sure. If I know for sure what is going on, I will send the police straightaway. The security guard has no added value at all. Before we send the emergency services, you want to verify.

Different types of safety

In addition, the safety of my grandmother gives a different sense of security than that of my house. My house is protected against burglary, but the home is not my primary concern with grandma. In the same system, I want to use the same sensor that is triggered during a burglary, but works the other way around for grandma: I want to know if grandma is not moving. What you don't want is fragmented solutions: purely for burglary, lifestyle monitoring, or other purposes. As a consumer, I don't want 25 apps; I don't want twenty boxes. I want a system that controls everything as needed from one environment with one app. However, you can never supply one system. The needs and the market are many times greater than what you can bring and deliver in your own environment. Otherwise, prices are going to rise enormously: you have to stock up, and then you just have to hope that people buy the products. That is a catch that you don't want to get into. We believe: you must deliver the core and be able to connect to devices. This way, the customer feels that he or she is doing everything using one app, while the interfaces are under water. KPN or Trigion should be active in such a market.

Emergency services' stake in data centrality

We see no conflict. Police, fire brigade and medical services almost require us to be the intermediate layer. As a first responder for real problems, you want to get as few false reports as possible. If I forwarded all my reports to the police, they would not be pleased. They do not have the information position to run the if / then analyses themselves. The information is mainly received by security parties. What we discuss with the police in covenants is this: we do the first screening. We do the deep learning and AI functionality, and then we pass on the information to the police. Conversely, they can also ask us something based on reports received by them. The police do not want to know, hear and see everything because they can't. You also see the evolution in emergency centers: from only receiving notifications they now also look at social media. We add the publicly available information about customers to our data image. For example, we can see it when people are interested in a certain location; and not in a positive way. This way we can estimate the risk factor of a customer; for example, for a power plant. Based on this information I may respond differently to a report of a fence alarm. That is soft information, but it gives a different threat assessment. This discussion has been going on for some time, but the police control rooms have now been centralized. It has now become ten rooms in the same platform structure. Trigion can then provide digital information, so that the police can put information digitally in their own system. Then it is also more reliable; when you call you just have to hope that someone understood it the way we told you. The next step is, the actions that the police take can be reported on the same session. This way I can also see which reports are false and which are not. The police also respond to false reports and cannot do anything about this. However, this does not guarantee that the notification will not be made next time. If, on the other hand, we receive the information, we can benchmark and inform clients that many false reports come from this chain or store. We can then propose that something should be

done about staff training. I have no interest in notifications, I have an interest in peace. If it is peace for me, it is for the customer too.

Sharing data

With the current KPN SmartLife structure, I am the professional provider that helps them, but the data is not mine. The data is owned by KPN in this case. I don't see who the customers are, or what reports there are. I see it temporarily; during the session that is open: there is an alarm and there is insufficient or no response. Only then the notification will end up with me. If consumers handle it themselves, I see nothing. That is a completely closed ecosystem. We are very strict in the data structure; it is not our data. I can imagine that an insurance company is interested in all kinds of reports. The question then arises: which reports can you provide to insurers? If there has been a burglar alarm at the customer, and the insurer asks for the login of the system, we will not provide it. An insurer is not our client. If the customer requests it, we will provide the information. The police are also not allowed to ask that question; unless they have a claim from the assistant prosecutor. In that case it is a burden and I am obliged to provide the data.

Using data

Apart from keeping track of notifications, a house can be monitored. An average IoT system produces an average of 30,000 info points per day. You can do something with that. The question is: who does what with it? From lifestyle monitoring we can, if the customer wants it, provide insight into his use. I can show the customer which patterns we see: the lighting goes on at a certain time or the energy consumption rises or falls. That is information at customer level. You could then look at the metadata level to see how many burglary reports are generated in the Netherlands. These are anonymous messages. In my database I can see that I have a certain number of notifications of that kind. This data is no longer tied to the customer. I can see that increase or decrease, or I see an equivalent trend. For example, trend analyses can be made to provide to a customer and to compare the customer's behavior with the trend. In this way, the customer also has an idea of whether things are going well and whether there is something he or she can improve. The customer must be in control. That data belongs to the customer, and we provide it to them.

When the session is closed I can no longer look back at KPN SmartLife. We would run the meta-analyses, but KPN could also do this for us. I know they can see it. They can check the customer database. It is then up to KPN to evaluate with Trigion whether adequate action has been taken. However, this is not happening at this point. This is a matter of choices. The technology is a no-brainer. In fact, we have built a virtual alarm center from KPN that is the same as my physical one. This has advantages and disadvantages, which we also discussed in detail. If a customer calls tomorrow and had a problem yesterday, I have to say I can't help them. I then have to call a KPN help desk that can see that. This requires that you have knowledge and expertise on the help desk for those specific questions. Another structure would be if we are also in the generic system. This also has a disadvantage: KPN cannot easily do business with another party. They are then stuck with us. We then become their hosting and processing party.

Opt-out

If a customer wants to, he can request an opt-out. We have an established interest in managing data because the law requires it. The NEN-EN 50518 standard says that as a security party I have to keep data available for two years. So, if the customer demands his or her data to be deleted, we must individually assess what is being requested. This way we can see if the vested interest that I have to comply with the law conflicts. I have to weigh that. Then I have to make a choice. If I indicate that our interest is considered more important, the customer must go to court. We have no needs to store data, but we do have obligations. This applies to a two-year period. When SmartLife came into

existence, there was no GDPR yet, but we were already working on the same line of thought. Privacy is an important good.

User agreements

As a customer, I enter into a user agreement with KPN. I don't need that with KPN as a customer. My contract makes it a reasonable interest for KPN to store my name, address, and telephone number. If KPN now shares that data with Trigion, there have to be user agreements in place between KPN and Trigion. We are a sub-user. We must then be able to show that we meet the conditions: that we have handled the data well and have not shared it. The customer can expect that but does not have to ask for it. If KPN does not arrange it, and we misuse the data, then KPN is responsible for this. I don't see any conflicts; you have to organize it.

With GDPR the sanity check came at a certain point, which stated how it should be read. Otherwise it is legally unjustifiable. These are concerns of the ecosystem partners; not the consumer. I think the consumer never thought about that. That's okay; it is the role of professional companies to arrange that. Similarly: if you take IoT devices into your home, they are inherently unsafe. However, if you take it from me, you may assume that I have thought about safety. You cannot hold consumers accountable if they do not think of that. We will be addressed, I estimate, if things go wrong. You will not get away with it as a professional organization.

Strategic conflicts or misalignments

The strategic objective of insurers is to reduce damage. I do not agree with the statement that our business case is reinforced by sending a security guard as often as possible. A security guard is a kind of last resort. If you look at emergency rooms: not all emergency rooms have a mobile patrol service. Their interest is: you have a report and you want to try to prevent false reports. Sending a security guard then always happens after something has happened. From a customer perspective: the customer must pay the security provider. The fact that it has not been prevented is a dissatisfier. We want to make the Netherlands safer. We do not need to send security guard, we need it to be well organized. Of the 450,000 reports that we mention per day, approximately 150 lead to deployment of security guards. That is not in proportion. We resolve all other reports in collaboration with the customer, either technically or because we arrange things remotely. Sending a security guard actually happens for two reasons. Of the 150, the vast majority is the conscious choice of the client to send n security guard. Then maybe ten notifications a day are left of which we say: we don't know for sure, but it doesn't feel right. That's the ratio. We prefer not to have security guards for surveillance at all. That is the last resort, because it is expensive, and it does not always lead to a solution. Looking at our contract forms, we much prefer to create an all-in contract. The customer takes a system linked to a control room, which costs an x amount. If I have to send the security guard ten or twenty times a day, that is my problem. If I have not organized the chain properly, it will cost me money. I have to keep sending technicians, security guards and security people. I then have an interest in doing it right. The moment the idea lives that the moneymaker is sending security guards, I need the people and infrastructure on the street as well. If I don't get any notifications then I have the people available. They cost money. So you have people available without certainty that you will ever create a billable hour for these people. That is a very unhealthy model economically. It's a misconception when people look at it like this.

In the same way at the central we want to do as automated as possible. Our goal is that a control room is completely unmanned and that computers do everything. We want to bring as much logic and intelligence as possible into the systems to support the operators, so that they only do relevant work. They pass the final judgment when the system no longer has a logical answer. That is why you can handle a huge number of reports with a relatively small number of employees. Otherwise you would get Chinese emergency rooms: rows of people looking at everything. We can't do that at all.

We have 26,000 cameras. I would not know how many screens I have to hang up to check all that footage. Computers watch the images. Notifications are generated based on this. I think we have the same interests as an insurance company in a general sense. Namely: that a customer *feels* safe and *is* safe. This can mean safety in healthcare, at home, in physical safety or in other forms. If notifications are generated, I want to see the notification, respond, act and resolve as quickly as possible. This way you prevent as much consequential damage as possible. That is what we are all doing. The advantage is that the customer is happier with the service. You cannot prevent it. You have different risk classifications; a nuclear power plant is protected differently than my house. You take your measures based on that, but all with the same goal: to protect the (living) environment in a way as undisturbed as possible. You do not want heavy security zones and a hard time entering your house; you want the system to recognize you when you have your hands full. People who are happy will also behave positively, and their behavior will also be positive towards others. If you are in a hostile setting, you will also look sour. The image of old guards from the past: they had to look angry, had a moustache, short hair and a cap. That was the role, but that was not the intention at all. You want that person to help you in the process of entering a building instead of feeling unwelcome. We have no conflicting interests with hardware suppliers, insurance companies or the police department. On the contrary, I increasingly see cooperation because we cannot do it alone. By linking the core competencies to each other, you create an ecosystem for such a service. This also makes society much better.

Interest in ecosystems

I started to notice the ecosystem vision within my industry about ten years ago. The problem with technology and adoption capacity is that it takes a while. I see more and more parties thinking about platforms. A mobile patrol service is almost always a one-to-one contract with a party. What is the real interest of that customer to take a security guard? The customer actually wants a security guard to come over as soon as possible. There are 300 companies with mobile patrol services in the Netherlands. In fact, it would not matter to the customer which one would respond; preferably the closest one. In that respect it is comparable to Uber. You want a reliable party that serves you. For this, you have a number of basic qualifications a security guard needs to satisfy. These kinds of conversations are gradually increasing. The importance is not the contract between two parties; it is important to offer a good service. The customer is not interested in your uniform or type of car. Actors are increasingly looking for cooperation: how can we help. The ideas begin to develop. There will also be such a discussion like taxi drivers had about Uber. Some things just go forward in this world. If you can't beat them, join them and communicate with them. You do not enrich your discussion by being opposed. Start a conversation and meet the other party somewhere in the middle. Developments in the Netherlands have almost always lagged behind. I believe that many things are just there; we do not need to develop or innovate. We just have to find them. Sometimes you have to find them in other market segments. You must then have the ability to make it adaptable. 80 percent is already there; you just have to customize it.

VII.J: Project Manager SecuritasHome and Business Developer at Securitas.

SecuritasHome

I started at Securitas 3.5 years ago. I have a business consultant and project management role. From that role, I lead a number of projects. I started as a SecuritasHome project manager. Within Securitas I started when we just had a strategic partnership on a European level with Alarm.com. That is currently the largest platform that integrates security, home automation, and video in one platform. They have around 7 million customers; mainly in North America. We were looking for a platform; they were looking for new markets in Europe. That's how we found each other. Then we started searching for a hardware supplier. The Netherlands was the first country to go live with the pilot. From the proof of concept, we started looking at the models that can be seen on the market: which models work and which do not? That is why I now have considerable experience in the field of partnerships. We offer a service on the market, which we call SecuritasHome when we sell it ourselves. It is a system with home security and domotics. With domotics I think of: light, thermostat, smart locks, garage door openers, irrigation systems, and cameras. Basically, everything that can be controlled remotely. With that we provide services from Securitas: a 24/7 control room connection and our mobile surveillance network. If a customer purchases SecuritasHome then that is all included in the price. In addition, it is good to know that we use a rental model. The customer rents all hardware from us. There is also a choice for consumers to buy the equipment themselves, but we see in the market that the willingness to pay a high up-front and a lower monthly price is lower than a low up-front and slightly higher monthly price.

Providing and integrating hardware

I have two opinions about offering customers the option to shop hardware themselves, which can then be integrated with the system. An emergency room environment is a secure environment. We are bound by regulations, so consumers cannot just add equipment to it. Therefore, an open platform in combination with a certified control room is not possible. We, as one of the three major security companies in the Netherlands, cannot afford to have non-certified connections to a control room where we receive other types of alarms. So that is a no-go from my perspective. We also think it is important that the functioning of the system and platform can be guaranteed. From that perspective, we work with a domotics whitelist. The consumer can also order the hardware somewhere else. Other products also function. For example, there is a device on the market that can shut off your water pipe when a leak is detected. We are now integrating that. It does work without integration, but then the customer sees it as a lamp. The question then is: how do you want your platform to be integrated with your hardware, and what is the functionality of that platform? I want to say to my customer: buy what you want, but be aware that perhaps it does not work properly. I can install it and set a smart rule: if the sensor measures a leak, the lamp must turn on. Functionally, my water pipe is then closed. I prefer that that device is recognized as a water valve. I am completely open for the customer to order what they want to order, but that way you do make concessions to the user experience of that customer. That is a consideration. Our consideration is: it is available. The client may install anything that supports the protocol, but they must be aware that their platform experience is not 100%.

There are several protocols that we are talking about. Security components communicate with an RF protocol in Europe. That is a secured frequency. The components that communicate with the control unit about that protocol are the only ones that go to my control room. We decided: we choose a supplier that is integrated with the platform. You have to make a huge investment to also open this up for other hardware. Within domotics we have chosen to use the general Z-wave communications protocol. You can link all equipment that has Z-wave or Z-wave Plus to our central unit and control it with the platform. Based on the Z-wave you characterize: how does the platform recognize what it

really is? That depends on how far it is integrated. For this we work with a list of products that are fully integrated. These come from different suppliers.

Cooperation with a telecom operator

We have been communicating for a long time and still have good contact with a Dutch telecom provider. We ran a number of pilots together and learned a lot. I think it is very important to look for partnerships for these types of products, because a KPN, Tele2, T-Mobile, and Vodafone-Ziggo are better known than a security company. People do have a good connection with us as a company, but not so much in a personal atmosphere. If you get back to the basics, the starting point should be: a customer has only one central unit. My conclusion: it is a nice point of view but it is not feasible. That's because I already have two units from Vodafone-Ziggo. They are even unable to get their television and WiFi in one device. Adding these types of components or transmitters is technically possible, but it takes years of development. What I see is that the telecom operator we worked with has no willingness to invest in this. They say: first we want to see if there is demand for it, then we start looking at further technical developments. The central unit that has everything in it is a nice idea, but I think the investment is quite substantial. Each device must then be given the extra modules, you must put a battery in it, and in our case you must have dual-path connectivity. We have a power station that works on electricity, and it has a battery that works for another 24 hours if the power fails. An IP cable goes in there, but there is also a SIM card in it. That is because, if the power fails, your IP connection fails. From the point of view of security, that is a no go. In our case, that is a locally roaming SIM card. This is not tied to one network provider, but can switch if the preferred provider no longer works. You have to take these considerations into account when developing such a central unit. This does not even include the connectivity that it contains and the firmware to be able to communicate securely with the platform and the control room. One of the reasons why Smart Home is quite expensive is because the control unit is reasonably pricey. That is simply because of the technology that is required for this. That is the hardware side of the spectrum.

Drivers for customers

I have the following example about partnerships. I am a Vodafone-Ziggo customer. I live in an area where the ADSL connection is not fast enough and where the cable speed is good. I have been a loyal Vodafone-Ziggo customer for a long time and am satisfied with that. My subscription includes digital television, internet, and a mobile phone contract. They have chosen to bundle these services. The consumer lock-in with Vodafone-Ziggo is very clear. I think that's a strong proposition. If I leave, it will cost me 20 euros in discounts that I will no longer have. If you are talking about bundling with partners, this is the story. Offering smart home services via a partner is going to give you a bit of traction but is actually just a sales channel. You get access to my customers and we will see what happens. That is interesting, but not the way you should think from a partnership perspective. At the moment I see little willingness of partners to start that conversation on bundling security/automation with their current products. I would advise you to take a look at Spark Morepork (New Zealand). We have been working with a Dutch telecom provider and other partners. Every time the conclusion was: we think it is interesting, but we are not willing to do anything about bundling products. We really only want you to make an offer to customers: purchase SecuritasHome via Vodafone-Ziggo, for example, and instead of the normal amount you will receive a discount. I see no willingness for that. When you talk about insurers, I think something interesting is going on there. I cannot fully predict that yet. Three years ago, there was no willingness and it was even difficult to talk to them. Recently we are even being approached by them. The same applies here: you cannot ask your customers to purchase a security system and not give anything back to for it. Why would I spend 30 euros a month on a security system offered via, for example, Interpolis if that company is not willing to reward me for that? As a consumer, I think that there should be a compensation. You can now see conversations taking place between these types of parties. However, I do not yet see that they know what to do with it and what kind of Business Model would suit that.

An option for the service you specified could indeed be if the insurer offers the consumer a discount. I get a five-euro discount on my Vodafone subscription because I also have Ziggo. So I also want a discount on my insurance because I have a security system in my house. Based on my conversations with insurers, I know what their greatest expenses are. You can also work with that. If you have home security, you will receive this discount. If water or fire protection is included, you will receive a higher discount. An example is connected smoke detectors: if they go off, as a consumer I literally have someone on the line within ten seconds to see if everything is okay. I could also have water sensors in my house and a device that can shut off my main line. Water is the biggest loss for insurers, so you can respond to that. You can expect a premium reduction for this from your insurer. I make life easier for my insurer.

Strategic conflicts with an insurance provider

I don't see any strategic conflicts between us and an insurer. With SecuritasHome, our mobile security guard is not a business; it is part of the core business that we deliver. We have professional operators who can accurately assess what is going on. If they know for sure, they can directly notify emergency services. In other cases, we have our own network of security guards. So I don't recognize the conflict of insurers pursuing damage prevention and the security party pursuing to send out security guards. With SecuritasHome you do not pay extra for every time a security guard is sent. As a result, we are somewhat more expensive in the monthly fee, because you must be able to offset the costs that you incur for this. Also, I do not believe that you should do this in a different way in the context of partnerships.

Data

We and the partners are interested in data. You use the data in the platform, but you do not use personal data. What you do is aggregate data to a level at which it can no longer be traced back to individuals, and improve your services from there. I have thousands of components that all communicate with the platform and send notifications (open, close, generate an alarm, low battery, etc.). We use this data to improve the service to the customer. For example, we can predict when a sensor is likely to fail. With that information you can go to the customer and already offer a new battery or sensor. That way you use the data. As long as customers have a smoke detector that has no battery power, they will continue to see the notification in the app. I think you can use this to create awareness with the customer. If I see every day that my smoke detector is no longer connected, I can choose to leave it that way. Securitas is not going to determine for the customer whether they want it or not.

Fluctuation of customer demand

I see a clear willingness to pay for safety and not really a seasonal fluctuation in customer demand. I have been watching the fluctuations for three years and I see only a rising line and few dips. What I do see is that people buy for safety and ease of mind. That is also where the willingness to pay lies. I don't see much willingness to pay yet for home automation. People like it and want it but are not prepared to invest heavily in it. It's a nice gadget when it comes to it, but I don't see consumers ordering five smart plugs. Toon certainly explains what a smart thermostat does for you, but even there I think the price level is still too high. That should actually be an easy product, and demand for it is stagnating enormously. They made a good start, but the demand is now stagnating. This is mainly due to the price.

Comparison with Achmea Homies

As a user you specify contacts; that could be your neighbors. You manage these contacts yourself from within the app. You can also set receivers for the notifications. we do not yet have a separate function in the app to have the neighbors confirm notifications and thereby create extra data points. We have thought about that. We think we have covered that now. We also do not receive any feedback from our customers, saying: I also expected this. This, however, are interesting aspects to think about.

Drivers for partnerships

I think the idea of building a partnership to shield off a large (American) conglomerate is naïve; because it will happen anyway. I think that you should also talk about partnerships with such parties. They can supply the technology, but not the rest. For me it is not a fear, but rather a fact that it will happen one day. Partnering up, I think is primarily a sales-driven approach. The three of you are stronger than you on your own. You have more marketing power. However, the cake is getting smaller for each partner; that's the other side. I believe that it is a strong proposition if Vodafone offers me as a customer extra discounts in a bundle of products. The question is: how big is the market that you are going to capture with that? The idea that we are in a growth market is certain for me. Especially if you compare Europe with America, I think that much can still happen. That challenge is huge. All three parties actually want to draw the value to themselves. They see the cake and want it for themselves. I think a lot of people will pay a maximum of 10-15 euros for such a service. The biggest challenges are as follows. Even if you bundle together, you (i) will not suddenly address another target group; it is not a game changer that opens the market completely. Not everyone is occupied with it. In addition (ii), if you offer a service with two other key partners for 15 euros, 12 euros remain after VAT, or 4 euros per partner. Then you still have your acquisition costs, hardware costs, platform costs, connectivity costs, etc. All of which still must be paid for. I see a huge challenge in distributing that cake within the current market. And then you even assume that you know how to distribute the cake. It is of course not so easy that you can divide the turnover among three partners. I think you can work towards it. You just have to really be willing to work on it together. Everyone must also accept that it will be a multi-year process that requires substantial investments. If it is integrated in a Ziggo central unit at some point, the components such as a magnetic contact are peanuts. Only then does it start to become viable. If you become a KPN customer and you have that control unit in your house, KPN makes a significant loss on you for the first two years. Again, I have been a Ziggo customer for eight or ten years. I believe that you can come up with a model together in which you have to get under twenty euros in costs. In my view, the long-term vision would be an important argument for cooperation between parties. You should think of current consumer lifetime value. These are currently relatively short, especially with a telecom operator. If you can extend this by bundling different products, you create stickiness with the customer. If the customer has an alarm system that is bundled with telecom services and insurance, he or she does not leave that easily anymore. Nowadays, you notice that other parties are already bundling. The sooner you are in offering a strong bundling proposition, the better. There are still enough customers who do not yet have that lock-in. I believe a strong bundling proposition should be an important starting point. You thereby create a customer portfolio with a long customer lifetime value.

VII.K: Strategic innovator at NN Sparklab

Sparklab

Sparklab was founded four and a half years ago to start thinking about business models of the future for the insurer. Within Sparklab, we are thinking about what the role of an insurer should be. We do that partly to respond to things coming our way. We innovate based on trends. These are mainly: we are becoming more mobile, we are getting older; trends like that. We use these trends to set up our own innovative vision from a number of perspectives.

Role of the insurer

Thinking of the role of the insurer in the future is relevant. One of those roles might be: damage prevention. If a customer has damage; nobody benefits; we all incur costs. It is better to help a customer prevent damage. The most important thing for us is that a business model is made for this. Can we be relevant for a customer with a new service, and can we develop a business model for that? It should not be free; for example: 'if you take out an insurance contract now, you will get free sensors'. That is not a motivation. Innovation is very broad. We use our own innovation method, and that is really just the LEAN start-up; think very big but start small. Experiment and see how you can develop a concept together with the customer. If you have that coordination with the customer, only then can you think about making it big. We actually pull apart inventing and scaling up. I often talk about the glass ball: we all just don't know what the future will hold; let's be honest about that. By doing it you will learn, and from there you can decide what the next step should be. Essential at Sparklab is to innovate with a business model. When considering the three horizons of innovation (incremental innovation, strategic innovation and disruptive innovation), we're focusing on horizons two and three. This has to do with the degree of certainty and the time. We almost not involved in incremental innovations. Everything we do for companies to make the product just that little bit better is what we gladly pass on to our parent company. That is the dividing line.

KPN SmartLife

KPN SmartLife has a lack of customer validation and is a very extensive service. That major approach is also due to Accenture's involvement. Accenture has advised on how to approach it. I am 100% sure that it has had to do with that approach; the approach was very comprehensive while the customer demand had not yet been validated. It was the thought behind it that pushed it to the market. Afterwards it's easy to judge. Still, I hope that it has been a lesson to approach it differently the next time

Learnings

You are talking about best practices for setting up such an ecosystem. Keep it simple and call it learnings. Best practices means that I will instruct you what to do. If you say: these are the learnings I have, consumers can determine the value for themselves. The most important consideration we had for joining SmartLife was that the service was very complicated. It's about smart homes, the overall service that is delivered, and the part within that that can be delivered by us. I found that too complicated. We always say: keep it simple. My advice: keep your service offering simple at first. That was the consideration at the time to advise KPN. We advised them to start with what they had initially come up with.

Strategic conflicts

I do not see that there are hurdles in differing strategic objectives between an insurer and security company. If the customer finds it important that a security guard comes check their house, then why not? If the customer finds it important to have comprehensive insurance, it is also fine. This is somewhat the old way of thinking: what is your role; what is my role? If the customer feels that someone should come by if he or she feels unsafe, why would I, as a party participating in the

ecosystem, be against that? The problem is: if I can only offer that because it is my only asset, then you do have a problem. Do you participate in the Ecosystem for the ecosystem or do you participate because you find the solution very interesting and want to contribute to it? So I have no problems with a security party. The only problem you are going to have is: is it going to be affordable?

Uncertainties

You always have uncertainties in a partnership. One of these is whether the service actually leads to damage reduction. If there is a certainty, it is easy to get into it. You have to dare to take risks. If it is tested in a controlled environment, where learning is more important than scaling, it is simply one of the uncertainties that you consider. If you say: the starting point is a lower claim burden, and from there I offer a discount, then you have not even thought of the customer. Then you push it. In addition, if you pay 20-30 euros per month for an insurance, and offer a 10% discount, I think you cannot make the trade-off of investment for the service versus the monthly benefit. You cannot finance everything from your claims burden; this will have to be several things.

Evaluation of damage limitation

Naturally, we want to evaluate the decrease of damage due to the service. If the assumption is: customers have less damage, then you want proof. This does not necessarily have to be in the form of direct customer data.

Emotion

With a burglary it is never about the money. It's always about the emotion. Why are we all talking about a financial disadvantage that you want to insure when the emotional value is many times greater? These types of events where emotion is very important are on a completely different spectrum

Purpose

Smart homes cover a broad perspective; and it are made great too. IoT is a technical product, for which the solution is important to develop collaboratively. A smart doorbell or smoke detector does nothing. It is much more about the business that you develop around it, and from a social role that we have together, it is more interesting to think about it: how can we prevent damage? That is more relevant than catching flies.

Ecosystems in general

What is important for your research is to dare to let go of the Business Model. All parties have a big mouth, but if the customer is so important and you step into an ecosystem together, you also have to dare to let go of your Business Model. I notice that most parties do not dare this. Trigion has a certain opinion, but if a security guard still has to be paid by the hour or by subscription models with a complex structure, perhaps not enough thought is given to customer value. For example: the customer does not pay until he reports something. That feels much fairer than pushing your old business model through. If nobody dares to let go of their business model, everyone is making the chain difficult and long. It is therefore more useful to develop this from a Sparklab instead of a parent company. In inventing you do things differently than when you are purchasing. If you want to link smart homes to a home insurance policy, you may tend to try and link two business models together. Then it doesn't surprise me if it gets quite expensive. If you look at ABN AMRO, they now have a smart homes subscription on top of the home insurance policy. That's fine, but it is two separate models that are offered with a little discount. I don't know if it works, but by doing it you can find out.

VII.L: Deal Execution Senior Manager at Accenture

VIP interactions & interdependencies diagram

I discussed these matters with KPN as well; also together with Nationale Nederlanden. That is relatable to what you are doing. Looking at the picture (*Figure 24*) I wonder what the use is of including a party like Hollander Techniek in the diagram. Can KPN not do it at the moment? I'd keep that generic and stick with roles if I were you. Indeed, the role of platform integrator can be fulfilled by multiple parties. I wonder why the connectivity services is still a process stream to the platform integrator. These are already in the platform. In addition, I wonder why there is a value stream called "reduced damage claims" between KPN and Nationale Nederlanden. KPN will not take care of that. The service as a whole provides this reduction in damage claims but not KPN specifically. You might also wonder if there are also value exchanges between Trigion and Nationale Nederlanden. If you are talking about an Ecosystem, you would expect that. I'd look at that once again. What is the value that Trigion or the police has to participate? I think that Trigion has value in this. There is also value for the police; because the communication between them and Trigion are based on the incoming data and they provide a clear picture of the situation. I would also say that Nationale Nederlanden can make decisions based on the sensor data. What is the added value of the process stream for platform access? Why should Nationale Nederlanden be able to log in to the platform at KPN? I can imagine that, based on an alarm, Trigion decides whether action is being taken or not. Or that Nationale Nederlanden makes decisions based on how often and where they break in, and Trigion has not responded adequately. If you say: you get access to the platform so that you can see that data, then I get it.

Causal diagrams

There were discussions about setting up these types of partner structures earlier. However, it is difficult to lift this off. One of the potential issues in this picture (*Figure 25)* is: does this really lead to a lower insurance premium? Or is it that they can give extra value to the customer? Is it only a discount or at the same time an improvement of the customer experience? Ultimately, they want to generate more value. Reduced damage claims cannot be passed on directly in the insurance premiums. If the insurance provider would do that, it would make little sense for them to cooperate because it provides them little net value. There must be a balance between the value that the insurance provider puts into this and takes out of this. I would not think in terms of conflicts, but in terms of hurdles. I would think in terms of "insufficient benefits to enter into such a complex collaboration." There are not really conflicts. It is more about: is it worth setting up this concept together?

In my opinion, these causal structures are logical; I think that they're correct. In this figure (*Figure 24*) I see the value for the customer and for the insurance provider, but what is the value for, for instance, Trigion? With a higher installed base there is also a value for them, because they then also have more customers, so more service revenues. Apparently, that is not all reflected in the same picture. I don't see all the actors. I sometimes find the pluses and minuses not entirely clear. It is apparently purely about the relationship (positive or negative) between variables. The more customers share their data, the better the insights, the better the service and the greater the effectiveness (*Figure 25*). After all, the value for the insurance provider is not only in the willingness of the customer to share data, but in the consumer data itself? I would say that the 'consumer data and feedback about the effectiveness' should also have a positive influence on the 'value for the insurance provider to participate in the service.' If you have the indication that people have the willingness to share data, that's fine. On that basis, the value of the insurance provider indeed becomes higher and they can say: let's try this out. This must then be realized. However, only the data itself has real value for the insurance provider, and not so much the willingness. On the other hand, this willingness does drive 'the value for the insurance provider to participate in the service', so

both are relevant. I'd put that loop in there. I recognize this (*Figure 40*). You want to improve customer behavior. I would make it positive: give the customer a discount or a goodie when the smoke detector is online more than a certain percent of the time.

Practical value of this approach

In practice, we have not yet reached the point where we can map out these types of structures and incentives. We didn't get much further than a picture similar to the VIP interactions and dependencies diagram. These types of causal diagrams we only had in our minds. In the end, I think there is value in this type of visualization in practice; especially to get the conversation between all parties going. But also to record it: the structures can be documented in this way. At the moment we do not go much further than yellow notes. I think this approach requires a lot of work, but it has value. It is exactly as you say; you have conversations with everyone and with this approach you immediately have a way to record it. That is nice and easier than having to write it down in text. In addition, it offers the opportunity to think further and further delve into it. It does not have to be correct and complete the first time. That doesn't matter, because you further delve into it step by step. This approach exposes what the requirements are; for example: which data is needed? For the design of the process and looking at whether there really is value in establishing this service, it can help. Maybe you can quantify it at some point. That would be the next step. For example: how much consumer data do you need, and what does that mean?

VII.M: Deal Execution Associate Director at Accenture

Introduction

I am an associate director for innovation within Communications, Media, and Technology (CMT). This includes KPN SmartLife; I set that up from scratch with a startup team. What is important in this is that we try to install smart devices in the house. Within Accenture I am concerned with innovation, the possibilities of new technology, and the applications for business models. I started at Accenture Strategy and then went to CMT. I have worked with these kinds of ecosystems 2-3 times in my career. That is both in the video / TV network, smart home, process discovery, and in the digital native - which is actually a thought leadership how you can develop these types of networks. If I look at the essence of that, the next thing is key, I think: it is difficult to give the partners a specific set-up in such a network. And to make that completely cost-effectively. What is important in thinking is that the core of the network is focused on the data being transferred. Not so much the information flow, but mainly the potential that that data has to redesign a product or service to the next level. You can look at it in a very practical way: I do indeed offer an insurance and security service, and that in itself should cover costs. However, the only reason for that network to exist is the future value I can get from the data I collect. The network itself does not therefore have to cover the costs in the first instance. The evolution that finds place brings the real value. With many of these types of networks you can see that it is an investment from the actors to gain access to that data. With this data, the actors can redesign their own products and services in order to increase the value. In essence, it is important that such a network partly offers comfort and security to the consumer in the form of a security service. However, what is much more interesting is the additional customer profile that is shaped. In the picture (*Figure 24*) you have defined an insurance provider as an actor; there is a certain logic in that. What is much more interesting is the customer profile that can be stablished; leading to a better assessment of a risk profile. To give an example: NN group has considered joining KPN SmartLife. Statistical analysis shows that you can give people a discount on their premium if there is a water sensor in the house, for example, because that package prevents damage. The funny thing is that you don't actually need a network for that. People who think that way already have less damage. You could also give them a placebo water sensor that is not connected to the network; then they are statistically eligible for a discount. That is because it is an awareness setting. You of course sell a real water sensor and not a placebo water sensor; but it is about profile enrichment: how do people deal with it? That is interesting. The second thing is that there are all kinds of dimensions. It is important that, in order for such a network to function successfully, we can dissect it in a number of steps. The first part is related to the direct execution of the network. The second is looking at the evolution of the network. Looking at the first, the value chains, the information and processes and services that are offered must essentially cover the costs, and specifically for smart home applications it is often a certain service that is offered with associated hardware. What is important is to create a critical mass and a certain lock-in for your service. This lowers the barrier for new consumers to purchase the service. What you often see is that the participating actors invest in the one-off of hardware, and include these costs in a monthly amount. For a consumer you can thus offer the service for a monthly fee; with the hardware included.

The core

In fact, it must cover costs and it must work. In this figure (*Figure 25*) you see a network that is logically constructed, but the core is not there. The core is: the future possibilities for the creation of new data assets. You set up a B2C model, but it's actually about the B2B2C model, or the B2B2B2C model that comes after that. These models often include the real breakthroughs. The question that must be asked in such a network: what is the new customer of this insurance provider based on this behavior? Or: what can the security provider do with this sensor data over time for the creation of a new product or service? You have to set up a working service with which you do not incur a direct loss. Often such a network is initially set up at a loss, because it is about the future value of the data

that you collect. With this data, we first look at whether you can improve the service and then we look at how existing services or products can be redesigned. This is not necessarily with the same end customer in mind, but also new customer target groups. To give an example: the insurance provider receives the sensor data and generates a (better) customer profile based on this. This allows the insurance provider to make more effective decisions for marketing targeting & segmenting. The more innovative application could be: by collecting sensor data from the end customer, a new product can be made. For example: elderly care. As an insurance provider you can expand your portfolio. As a customer, you are eligible for lower insurance with sensors. In addition, I offer a socially relevant family app, for example, that shares the activity of sensors in a family circle. You can use this to monitor the elderly. So I reuse the data, and thereby create a future revenue stream. The first model does not have to be profitable, but the second one does. If you have mapped the customer and his family profile, that is valuable for a third product. So what you do every time is creatively rediscover what the future product will be. These ecosystems function especially well if you do not start with the key question: "What price do I charge for it?" But: "What data do I collect?" And what is the value of this data in the future?" This also explains the logic for setting up KPN SmartLife on a large scale.

Evolution of the ecosystem

For me, this picture (*Figure 25*) does not contain the core. When I look at this approach, I conclude that it is accurate at this time. What really matters is the future tradeable assets that you create. So you actually have to look in the approach at the evolution over time of such a network. It is of course difficult to estimate the future value. What you could do to illustrate this is starting at t = 0, and then show at t = 1 what the new types of products are in the ecoystem. As a comment on the approach, I would like to say that it should be approached from the evolution of an ecosystem; and how that will expand in the future. The ecosystem itself is rarely profitable. These are typical activities of a digital native such as Facebook or Google; the fact that they have created that billion-dollar position is not because their core proposition was worth much, but the evolution and the continuous design thinking. The only thing that matters is: what can I come up with to get data so that I can improve the service even better and launch a new product? What kind of data does that product bring, so that I can take the next step? You should include this in the approach. In this way we also try to substantiate the willingness of actors to participate in the ecosystem. If all goes well you already know what the future product will be, and you try to set up the network for that. Imagine that you want to set up an Artificial Intelligence network for the assessment of risk profiles and thus have the best price in the market. With this type of network you need many examples. This may offer you as an actor the opportunity to improve the risk model that can also be applied to other clients. The most important thing is that you always collect the data for a future purpose. Consider the commotion around the app that can make your face look older. These faces are sent to a server in Russia, and we don't know what happens to them. That app is a kind of gimmick; it shows how you age over the years. All it does is collect faces to improve facial recognition software. The business income comes from the sale and improvement of that software. You as a user enter into a transaction by showing your face you get from the app how you will look later, but you are the product because you give your own face away. You trade the value of your face for a picture in which you see yourself, but then older. With those faces they can draw up a new business model from which much more can be achieved. In the models that Google offers, that data is always behind that. That is inherently ingrained. What everyone thinks is that big data looks at patterns in the sensor data. That is completely wrong. You just have to think about the next product I can use to conquer the market, and what can I do to collect that data to get into that position? That is actually a very different way of thinking.

Privacy

You need a clear privacy policy. The BBC has a nice one. What really matters is: I consent to transact. I get an improved security or comfort situation, and a lower insurance premium. In exchange, I give my data plus a lower fee than usual. If I do not consent to this, I cannot use certain services either. It is therefore an opt-in. Suppose I want to be share my date for water damage, but not for burglary. The data will not be shared, but then you will not get the full service and no one will come check if there is a burglary.

As-a-service model

With the example of the connected smoke detector: if the battery is low, it is even better to send a new battery as a service. I would do that. For example, prevention can also be realized for a refrigerator that is likely to start failing. As an insurer you can also enter the replacement cycle with a new product. As the devices age, the risk of fire increases and the energy consumption increases. It is interesting for insurers to think about, because these services reduce the concern of customers. They offer a type of comfort that usually described as ease of mind; that is actually the product that they are selling. If something goes wrong there is someone who takes care of me; there are enough finances available if my house is on fire. Helping to also reduce energy consumption is therefore not an illogical step for an insurer to take, because that relates to the theme of ease of mind. That would be my core in your approach. What we see in your actor picture is a t = 0 scenario. What you want to see is a detailed t = 1 picture for one of those actors. Then you look at the effect. What you will see is that certain feedback loops will develop: (i) the existing feedback loops can be reinforced and (ii) new ones can emerge.

The value of data

Abstractly speaking, we can do three things with that data; which reinforces certain feedback loops for the value attributed. The first lies in the improvement of the existing product and service. With sensor data you know about time when, for example, water damage occurs and you may be able to do predictive analyses and even better estimate when something will happen. This leads to a better product and service, so that more customers can be attracted. More customers provide more data, and with more data I can improve the service again. That is one: the easiest. The second is that you use it to improve the service on the product. That is a bit comparable; you could model it together. The reason it is often mentioned separately is, for example, if there are problems with the installation and you call the call center, there is already a pre-diagnostic report from the sensor available when you call. That's because in the setup you have a separation between the service that runs and the assurance processes that revolve around it. In fact, you could also see that as an improvement of the service. The third option is the value creation of a new feedback loop: can I use my sensor data to create a behavioral model (real time) of a resident? That could be a form of elderly care. I place my water sensors in my bathroom or washing room. If I add a motion sensor, I can make a behavioral map. If someone does not appear in the bathroom for a longer period of time, I can alert my people to come and take a look; in a non-intrusive way. Then you need a family that has that (daughter, son, neighbors). Then you collect profile data. This will enrich your customer profile. Life category, income, etc. It can be used for marketing, but you can also improve the primary service with this. What you should actually do in the approach is allow yourself to think about the t = 1 or t = 2 scenario. Then you look at what the effects are in the approach on the existing loops; and how they reinforce each other. These different feedback loops are a way to substantiate the logic for actors to participate in the ecosystem. This is because the first system is often loss-making. That is the entire struggle. If you look at Facebook, Google or Amazon; they suffer losses in the early years and only become profitable in later years. They wait until that data is collected, and then monetize it in the form of a new product. Monetizing that data is not selling the data. Targeted marketing could be better, but the core is: creating new services or products, where the use of data is revolutionary.

Causal diagrams

What is important is the effectiveness of this type of loops (*Figure 25*). It would be nice if there was a formal note in the diagram with the actors. When I look at the picture, I don't see the names of the actors who are directly connected to it. I would rather look for a combination in which you clearly establish the value exchange network and indeed plot the causality loops on it. It is about the combination of that cross section. It is always a visualization of the concerns, so you have two types of variables that you have to visualize to make a statement about it.

If you look at the notations (*Figure 25*): the cost of damage is a certain decrease in the eyes of the consumer. What is important in formal notation is that this sign is put down logically. When the costs of damage decrease; does that apply to the costs for consumers to adopt the service? The implicit assumption is not explicitly mentioned. I see a positive causal relationship between value for customers to adopt the service and installed base. I then read that the value to the customers to adopt the service increases. What does the plus on the installed base do? The connotation of that plus must be clearer. The plus counts another unit: a customer that is added to the installed base due to the increase in value for customers to adopt the service. It is a customer that is added, and not the value for customers to adopt the service. Suppose that the value for customers to adopt the service can be measured with the unit: reassurance. The reassurance unit cannot be added to the installed base, because I count people there. This formal notation must be adjusted in the sense that the unit is equal; or the causality ratio must be described. The plus then only gets a connotation of increase.

If you want to be more formal in your approach, you must look carefully at the exact effects of the pluses. In practice, when you talk to people it is never an issue because everyone thinks the plus refers to an increase in the installed base. However, if you read it exactly, it is not correct. My suggestion would be to make a graph network of it and formally write down the transaction and the unit that is increasing or decreasing. That means in practice that you give the causality relationship a number, and then describe what that relationship is and which unit belongs to it. The picture is multi-interpretable. I apply the minus or plus to the nearest object. If you want to improve the approach, I would improve the formal notation. You must prevent ambiguity. My suggestion would be to add a description for each arrow. In this case the cost of damage is in Euros. You then have to make the effect explicit: a lower value. You could express this in the unit *experience*. There a causality ratio between those variables. Finally, you can give an illustrative example: if the costs of the damage increase, the value (experience) for the customer decreases. If the cost of the damage goes down, the value (experience) for the customer increases. You then have a theoretical construct in which you first establish the causality between the entities that you appoint, and then you make explicit what the effect is if you change one. Finally, you must also say that causality goes in one direction. Making these types of things explicit also helps with the next step in the SD approach: quantification. There is no value in the approach if you discover a discrepancy.

VIP interactions and interdependencies diagram

I used to work with value exchange graphs. That is very similar to this diagram (*Figure 24*). In these graphs you explicitly define the product or service, and the value that I get back from it. I cannot think of another another method to make that visible; because you have to be able to describe actors and their actions. The image seems to be logical. It is somewhat extensive. What is important is that everything must be conditional. If I draw a random arrow, it can't work. This way you can confirm that this arrow belongs in it. In this case, the service platform could also collect the money for the insurance provider. This is a frequently used structure; otherwise I will receive two invoices. In fact, the safety & security service is provided by the platform. The payment of the insurance provider is essential to include. If that is not in your model, you may have water damage but cannot be paid. You can then include it in the insurance coverage, or explicitly model it, and say: I will receive payment for my damage. The insurance coverage; is that an experience aspect? You must

also make this explicit. What helps with these types of pictures is going through the use cases: show such an alarm message with a number of arrows. There is a time dependence in such a network. These use cases are useful for evaluating: have I included all transactions in this picture? And what is the scope of the use case? With that you can also make the scope explicit. This offers the possibility of expansion of the service. The supplier of a new parquet floor in the event of water damage apparently does not provide any service (for example, this does not immediately make an appointment), so this is not included in the ecosystem. This would be a possible service. You can thus use it to expand the service you have defined. What is the value for the customer for paying out a damage claim with a wet parquet floor? You could immediately arrange someone to fix it. That is real relief. A creative way to think for an insurer is: take the real concern away. This is a new service for which people may want to pay.

KPN SmartLife

We have set up SmartLife in the same way. In the first instance we started with a security case. We based this choice on the market research we did. the ultimate goal was to grow into a connected home. This was five years ago. The strategic goal was: to guide the customer through the digital complexity of life and to unburden them. The perception of the telecom operator had to change into a caring telecom operator. With that goal in mind, they wanted to set up a smart home service. This required a platform; and the question was how to get started. It turned out that offering connected home per se to the market was not understood. The market introduction can best be done using a use case identification. That means that people have a problem; you have to tackle that problem. If you say: you can automate your house, nobody will buy it. If you say: you can go on holiday with a comfortable feeling thanks to this service, they will buy it sooner. This was the foundation for the platform. If we had that security data (we also sell door-window sensors); we then looked at whether we could use this for elderly care and make an offer for single elderly people. We had already considered these types of cases when we set up the security case. The idea was that financing in the beginning is an investment to make other cases possible later. This is difficult in practice; because there must be a strategic belief. If you have a short-cycle company with a direct focus on internal investment, then that can be contradictory. These types of ecosystems cost a lot of time and investment; but then the value thereof can also be extreme. There is a big risk, but a potential extreme reward if you think about it thoroughly.

VIII: Business Model roadmap

This appendix presents the final step of the process framework: the BM roadmap. During the interviews, several interactor misalignments and conflicts came to light (*see paragraph 5.2.3*). Interviewees were able to present several activities to eliminate these misalignments and conflicts (*see paragraph 5.2.4*). However, because of the way the interviews were structured, the interviewees were unable to backcast the desired transition trajectory and sequence the activities in a logical order. Instead, the researcher set up this roadmap based on his own reasoning (*see Figure 44*). Resultingly, any sequence of the first three activities turned out to be an option. The only requirement is that these first three activities precede the fourth activity: *simulating the scenarios in the trial phase*. The four activities presented are sequenced as follows:

The exclusion of sensor equipment is an activity that should be managed by the platform provider: KPN. As with KPN SmartLife, they offer the central platform to the market, which includes hardware, software, connectivity, IT service management, customer help desk, and the integration of the functions. Because of this, KPN controls which sensor equipment is offered. The activity to exclude this equipment from the service offering and to offer consumers a white list of supported equipment thus lies with KPN. As this changes the service offered to consumers, the activity is part of the *Service* component of the STOF ontology. This is the first step in the BM roadmap.

The next activity is *to establish an all-in contract with the security provider*. This is preferred by security providers and removes the concerns of strategic conflicts between the insurance provider and security provider. This activity should be managed by Trigion and, as it changes the service for consumers, relates to the *Service* component of the STOF ontology. It also changes the revenue model for Trigion, so could be categorized as relating to the *Finance* domain of the STOF ontology as well.

The next activity is to start *incentivizing the consumers by linking the insurance premium to the amount of personal data they are willing to share.* NN group is responsible for this activity. Just like the previous two activities, this activity changes the service for consumers and thus relates to the *Service* component of the STOF ontology. This activity changes the revenue model for NN group, so could also be categorized as relating to the *Finance* domain of the STOF ontology.

Finally, *the scenarios can be simulated in the trial phase.* The service should be tested with different sensor equipment that is taken up in the white list. That is why the activity '*exclusion of sensor equipment*' should precede this activity. With these different types of sensor equipment that are taken up in the white list, incidents can be simulated, and the effectiveness of the service can be evaluated. Based on this output, the white list can be tweaked. Also, during this trial phase it can be evaluated if the all-in contract with the security provider proves to be viable and if the variability of the insurance premium based on the amount of data shared proves to be a proper strategy for consumers to share their personal data. This activity is not necessarily related to one of the four STOF components and is therefore categorized as 'other activities'. KPN as a platform provider and Trigion as a responder to connected notifications are responsible for running and evaluating these scenarios.

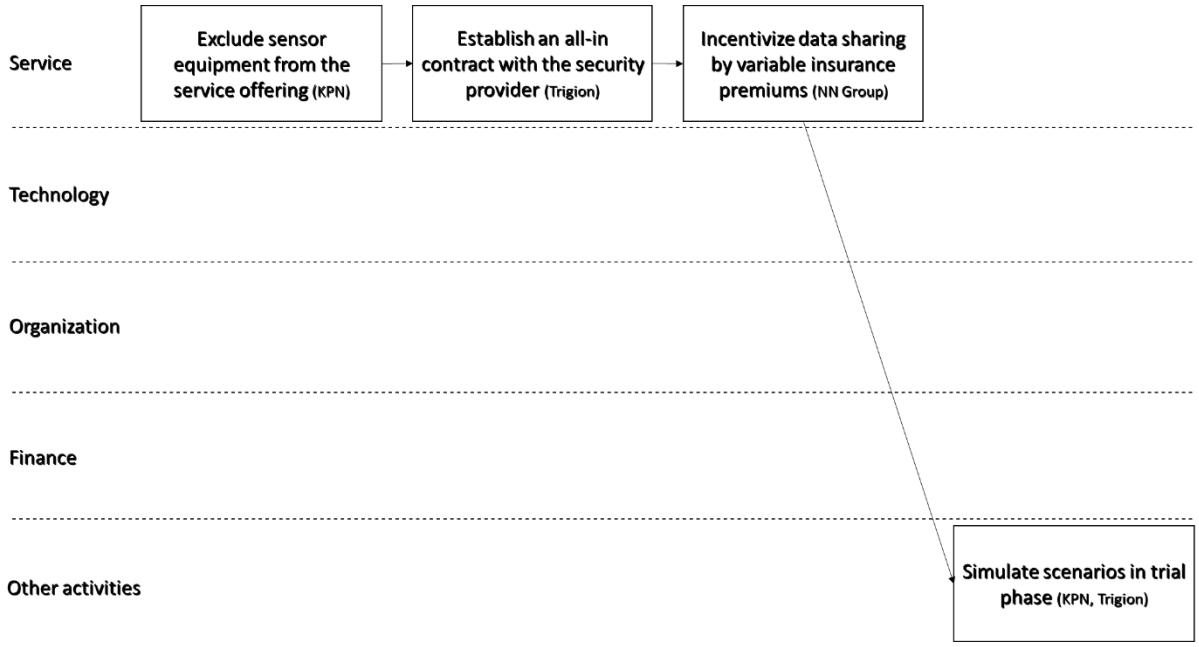

Figure 44 – Business model roadmap.