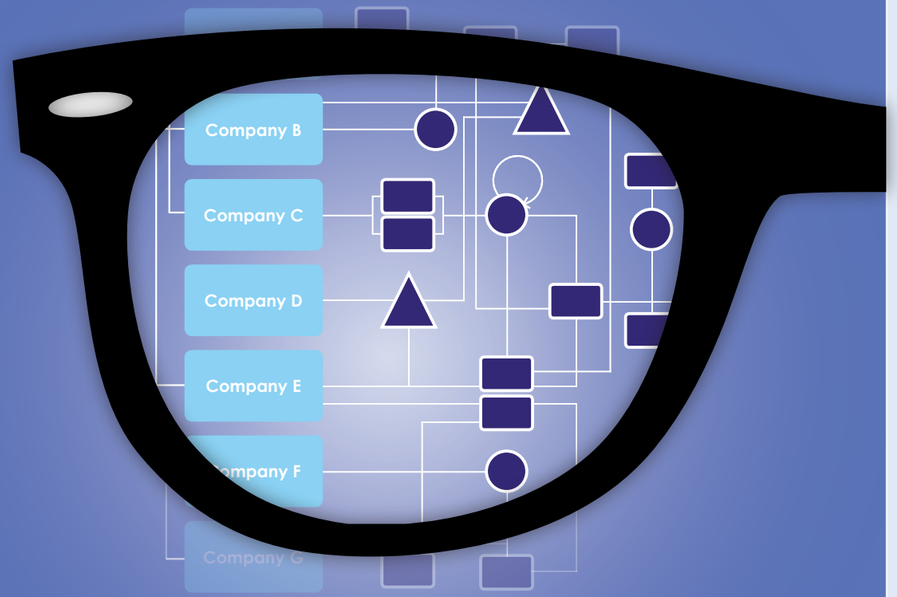

For a long time, technology has served as a silver bullet to gain a sustainable competitive advantage and to outperform the competitors. However, access to and exploitation of technologies gradually becomes a commodity, hence a less powerful resource to be leveraged to a competitive edge. Instead, companies increasingly are captivated by the charm of the Business Model concept as a way to create superior value for themselves, their customers and partners. Despite increasing attention, literature on Business Model has remained in a high-level conceptual realm, providing a rare insight into the actual implementation of Business Model and the factors that affect the feasibility of Business Model. Even less is known about the implementation of Business Model within networks of collaborating organizations. In response to the discussed conceptual gap, this research studies how the design and implementation of networked Business Models can be aligned and what factors affect the alignment.

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The Alignment of Business Model & Business Operations

Sam Solaimani

INVITATION

You are cordially invited to attend the public defense of the PhD dissertation by

Sam Solaimani

The defense will take place Wednesday January 29th at 12:30 in the Aula of Delft University of Technology, Mekelweg 5, Delft

At 12:00, there will be a brief introductory presentation

After the defense, there will be a reception

The Alignment of Business Model & Business Operations

within Networked-Enterprise Environments

Sam Solaimani

The Alignment of Business Model and Business Operations within Networked-Enterprise Environments

Proefschrift

ter verkrijging van de graad van doctor
aan de Technische Universiteit Delft,
op gezag van de Rector Magnificus prof. ir. K.C.A.M. Luyben,
voorzitter van het College voor Promoties,
in het openbaar te verdedigen op
woensdag 29 januari 2014 om 12:30 uur
door

Hesam SOLAIMANI KARTALAEI

Master of Science in Business Information Systems,

geboren te Behbahan, Iran

Colophon

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Sam Solaimani
Delft, 2013

Table of Contents

List of Figures

List of Tables

*For **Hosein** & **Shahla**, my beloved parents,*

for all the sacrifices they have made for me

&

their unconditional love.

Chapter 1. Introduction

> *"[P]eople like building Business Models. It's wonderfully abstract, and it's fun – like playing with model-trains, where the passengers are only imaginary and the trains really can run on time. Unfortunately (or fortunately?) the real world is a bit different from that… Real-world detail can break the best-looking business-model without even breaking out a sweat. We need to know that detail – or at least have a better sense of that detail – before committing ourselves and others to a lot of hard work and ultimate heartache."*
>
> (From Tom Graves' personal weblog, 2011)

Traditionally, reliance on external collaboration between enterprises primarily involved relatively simple functions or products (Mowery, 1983; Nelson, 1990). Collaborations generally emerged between companies with the same, similar or related services or product portfolios. With the emergence of Information and Communication Technology (ICT), business markets and technology have become highly dynamic, the service/product life cycle is getting shorter, urging companies to speed up their processes, increase their responsiveness and become more flexible and innovative, while keeping overhead at a minimum; all to stay ahead of the competition (Chesbrough, 2006; Thompson, 2008). As a result, nearly every step in the service (or product) life cycle from discovery to distribution goes through various forms of corporate partnering (Powell *et al.*, 1996). More recently,

A modified version of this chapter was presented at the 18th ECIS Doctoral Consortium (Pretoria, June 2010) and at the workshop on Information Management Qualitative & Quantitative Research Methodology (Erasmus Research Institute of Management, Rotterdam School of Management, January 2013). I am grateful to the organizers and participants of these events, especially Prof. Izak Benbasat and Prof Niels Bjorn-Andersen at ECIS conference, as well as Prof. Eric van Heck and Prof. Piet Ribbers at ERIM workshop, for their constructive criticism and feedback.

collaborations increasingly transcend the traditional dichotomy of market and hierarchy, and look for new opportunities beyond their existing sector boundaries, shifting from vertical corporations to networked enterprises (Baken *et al.*, 2006; Chung *et al.*, 2004; Corallo, 2007). Networked enterprises are closely linked companies that together aim to enable and provide services and products (a detailed definition is provided in chapter 3.4). The evolving paradigm shift from collaboration towards networked enterprises with diverse stakeholders entails not only opportunities, but also complexities when it comes to creating and implementing collective business objectives (Thompson, 2008).

Generally speaking, projects start with a business concept (idea) that needs to be implemented through a set of activities and processes. To enable business innovation and to represent (innovative) business ideas in a comprehensive and comprehensible way, Business Model innovation and design are becoming common concepts and widely disseminated approaches (Bouwman *et al.*, 2008; Chesbrough, 2007, 2010; Osterwalder, 2004; Timmers, 1998; Weill and Vitale, 2001). Although there are many definitions of the concept of Business Model available in various academic communities, there is no consensus among scholars on how the concept should be defined (e.g., overviews are provided by Osterwalder *et al.*, 2005; Pateli and Giaglis, 2004; Zott *et al.*, 2011). Nevertheless, in general, a Business Model has been characterized[2] as a description or model that represents a firm's logic to create, provide and capture value from and for its stakeholders (Bouwman *et al.*, 2008; Gordijn and Akkermans, 2001; Linder and Cantrell 2000; Magretta, 2002; Morris *et al.*, 2005; Timmers, 1998; Weill and Vitale, 2001). Although having a Business Model has been promoted by several scholars (Chesbrough and Rosenbloom, 2002; Magretta, 2002; Osterwalder, 2004; Zott *et al.*, 2011), having one does not seem to ensure a successful commercialization of the intended business idea (Bouwman *et al.*, 2013). According to Teece (2010, p. 192), "*not surprisingly, it*

[2] A more specific definition is provided in section 1.2 and the concept is extensively discussed in section 3.2.

is common to see great technological achievements fail commercially because little, if any, attention has been given to designing a business model to take them to market properly."

More recently, several scholars have articulated the need for Business Model analysis and evaluation with the aim of exploring and explaining how a Business Model is (or should be) implemented, and how its operational feasibility should be determined and ensured (Bouwman *et al.,* 2012; Debei and Avison, 2010; Teece, 2010). The need is even more pronounced within a networked enterprise and its inherent complex process of *"value co-creation, co-conversion, and co-capturing together with the different players in the ecosystem: customer, competitors, complementors, and community"* (El-Sawy and Pereira, 2013, p. 4). Although a Business Model describes the intended values and (collective) business objectives, the *implementation* of the Business Model is not included in the model itself (Gordijn *et al.,* 2000a). Instead, the business processes operations within and among stakeholders describe how a Business Model should or can be implemented (Bask *et al.,* 2010; Bouwman *et al.,* 2008), and *how* should *whom* do *what* to gain *which* value (Gordijn *et al.*, 2000a), taking into account the firm's systems, processes and (IT) infrastructure. Inescapably, the evaluation and analysis of Business Model implementation require an evaluation and analysis of the alignment between Business Model and Business Operations, which, in turn, is described by intra-organizational and inter-organizational (in case of a networked environment) operational processes and activities, at various levels of analysis (Al-Debei and Avison, 2010; Bask *et al.,* 2010; Bouwman *et al.,* 2008; Cavalcante *et al.,* 2011). Although existing literature on the operational Business Processes is abundant (e.g., Business Process Modeling, Business Process Management, Business Process Re-engineering – for a detailed description and references, see chapter three), the link to Business Model design and analysis has hardly been investigated (Al-Debei and Avison, 2010; Bask *et al.,* 2010; Bouwman *et al.,* 2008).

To summarize, existing literature on Business Model and Business Operations underlines the relevance of and need for an alignment between Business Model and Business Processes; however, what remains implicit and underdeveloped is how that alignment can be analyzed and evaluated,

what factors undermine the alignment, and how the alignment can be effectuated or improved. To explore these questions within a real-life setting, this study focuses on a specific research domain, i.e., Smart Living. The next section describes what the Smart Living domain is and why it is an interesting area for studying Business Model and Business Operations alignment. For a more detailed discussion of the Smart Living domain, see chapter two of this book.

1.1 Research domain

Smart Living is an emerging area, where multiple actors (sometimes from different industries) pool their resources and capabilities to create and capture value from new services and products. In the early 1980s, the concept of the Smart Home was introduced by the construction sector (Aldrich, 2003). The original idea was to improve the comfort of people's homes through Information and Communication Technology (ICT), not only to automate different aspects of life at home, but also to anticipate user needs (Harper, 2003; Weiser, 1991). In the last three decades, the concept of Smart Homes has evolved into Ubiquitous Computing, Ambient Intelligence, and, more recently, Internet of Things and Smart Living, which transcends the limited physical boundaries of the living environment (e.g., Smart Cities[3], Smart Factories [Zuehlke, 2010]). Chapter two of this book provides an extensive overview of the trends and developments in this area.

Although the recent fast-paced developments in technology have created a new wave of interest in Smart Living (Cook and Das, 2007; Peine, 2008), today's homes are mainly equipped with technologies that were invented decades ago. Companies that provide Smart Living services and products, the aim of which is to increase our quality of life within and beyond our residential homes, face difficulties with regard to commercialization (Harper, 2003; Peine, 2008; Shabolt, 2003). For a long time, technology-related limitations, including interoperability, privacy and security,

[3] IBM Smart Cities: http://www.ibm.com/smarterplanet/us/en/sustainable_cities /visions/index.html (All the hyperlinks in this thesis are last retrieved on 21st September 2013)

production costs, usability, and usefulness, were responsible for commercial failures (e.g., Aarts, 2004; Aarts *et al.,* 2001; Chan *et al.,* 2008; Demiris *et al.,* 2004; Gann *et al.,* 1999; Harper, 2003; Leinter *et al.,* 2007; Remagnino and Foresti, 2005). However, given the unprecedented fast-paced improvements in technology and our understanding of user behavior, the situation is gradually changing.

Thus far, little attention has been paid to the non-technological issues that (might) undermine the viability and feasibility of Smart Living projects (e.g., service value for providers, organizational collaboration, operational implementation and financial feasibility). In line with the discussion presented in the previous section, this research focuses on the operational feasibility of Smart Living projects. More specifically, this study aims at exploring how Smart Living projects can evaluate and increase the implementation feasibility of a Business Model that is designed to enable the Smart Living providers to monetize their innovative ideas and commercialize their services (which are often driven by excellent and innovative technologies). The next section advances the theoretical argumentation that helps us understand the concept of Business Model design and implementation.

1.2 Literature overview

Although there is no consensus on how the concept of Business Model should be defined (Mahadevan, 2000; Porter, 2001; Rappa, 2000; Shafer *et al.,* 2005), generally speaking, the concept refers to the value(s) businesses need or wish to create, deliver and capture from their services (or products) to meet their strategic objectives (Afuah and Tucci, 2003; Casadesus-Masanell and Ricart, 2010; Chesbrough and Rosenbloom, 2002; Linder and Cantrell, 2000; Magretta, 2002). One of the earliest definitions was provided by Timmers (1998, p.2), who defined a Business Model as "*an architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues*." The concept of Business Model has been investigated and used by many scholars and practitioners from various disciplines and in various contexts (Cavalcante *et*

al., 2011; George and Bock, 2011; Osterwalder *et al.,* 2005; Pateli and Giaglis, 2004; Zott *et al.,* 2011). However, the fast proliferating body of knowledge on Business Model (e.g., for an extensive literature review, see the work provided by Al-Debei and Avison, [2010]; Baden-Fuller and Morgan, [2010]; Morris *et al.,* [2005]; Pateli and Giaglis, [2004]; Shafer *et al.,* [2005]; Zott *et al.,* [2011]) has remained in the conceptual realm, focusing on definition, classification, typology, ontology (see chapter three for an extensive discussion of all these areas). Gradually, more and more scholars and practitioner have acknowledged the need to shift the current business/strategic focus towards Business Model implementation, theorizing and developing approaches to analyze Business Model viability and feasibility (Bouwman *et al.,* 2008; Debei and Avison, 2010; El-Sawy and Pereira, 2013; Morris *et al.,* 2005; Teece, 2010). The gap is even more significant in multi-actor environments, which are marked by countless, heterogeneous and often fuzzy, and even conflicting interactions and processes between the actors involved (Ballon, 2007; Bouwman *et al.,* 2008; El-Sawy and Pereira, 2013).

While a Business Model describes *what* the business ought to be doing, the *how* question is answered by Business Operations. In this study, Business Operations can be defined as "*the firms process-level activities, functions, systems and capabilities, required to run a business for the purpose of creating, offering, capturing and sustaining value for the stakeholders*". Gordijn *et al.* (2000a) emphasize that, although Business Model and operational processes are strongly related, their distinct nature should be recognized and understood. With respect to the link between Business Model and Business Operations, two areas are essential in understanding how a business operates, i.e., Business Process Management (BPM) (e.g. Giaglis, 2001; Lin *et al.,* 2002; Recker and Rosemann, 2009; Yu and Wright, 1997) and Business/Enterprise Architecture (e.g. Chen *et al.,* 2008; Lankhorst *et al.,* 2009; Versteeg and Bouwman, 2006). While BPM aims at incorporating all activities relating to the transformation of knowledge about business systems into models that describe the processes performed by organizations (Scholz-Reiter and Stickel, 1996), Enterprise Architecture (EA) deals with the design and realization of an enterprise's organizational structure, business

processes, information systems and infrastructure (Bernus *et al.,* 2003; Chen *et al.,* 2008; Lankhorst *et al.,* 2009). From a slightly different viewpoint, Business Architecture (BA) aims at providing a top-down structure of the enterprise and a common understanding of its business objectives (Versteeg and Bouwman, 2006; OMG, 2013b). Commonly, business operations (in terms of processes, systems and infrastructure) are a pivotal part of both areas. Furthermore, although not specifically the focus of this research, it is noteworthy that a *platform*-centered architecture increasingly takes a more prominent position within networked enterprises (Rochet and Tirole, 2006; Tiwana *et al.,* 2010). A platform "*embodies an architecture - a design for products, services, and infrastructure facilitating network users' interactions - plus a set of rules; that is, the protocols, rights, and pricing terms that govern transactions*" (Eisenmann *et al.,* 2006, p.5).

Although studies and publications on both Business Model and Business Operations (including BPM and EA) are abundant, limited attention has so far been paid to the link (or alignment[4]) between the two. There are a few relatively recent attempts that aim to bring Business Model closer to Business Processes, or vice versa (e.g., Andersson and Johannesson, 2009; Edirisuriya and Johannesson, 2008; Pijpers and Gordijn, 2007; Weigand *et al.,* 2007 – see chapter three for an extensive discussion on these approaches). However, these approaches have at least one of the following shortcomings:

a. *Descriptive versus analytical.* Some of the available approaches do not provide or support any analysis regarding Business Model

[4] The alignment between Business Model and business processes might resemble the extensively investigated concept of *Business-IT alignment* (BITa) (for a detailed literature review on BITa, see Chan and Reich, 2007). However, BITa specifically refers to the intra-organizational collaboration between business domain and IT domain with the aim of reaching a common goal (Campbell, 2005; Luftman *et al.,* 1993; Reich and Benbasat 1996) or the degree of coherence between realized business strategy and realized IT strategy (Henderson and Venkatraman, 1992; 1993), and is not related to the literature on Business Model and inter-organizational business processes.

viability and feasibility, but instead aim at (graphically) representing the Business Model in more detail, or converting/mapping a Business Model to a process or architectural model.

b. *Single-firm versus networked-view:* Some of the available approaches have a single-firm unit of analysis, aiming at deriving one specific (business or process) model from another specific (business or process) model, focusing on intra-organizational processes or single-firm architecture. A single-firm view is barely useful in a networked-enterprise environment, with its inherent complexity caused by a large number of heterogeneous inter-organizational interactions and processes.

c. *Single level-of-analysis versus multiple levels-of-analysis:* Some of the available approaches focus on one type of activities and processes and remain implicit with regard to various other levels of analysis, particularly within networked settings. In describing Business Operations, at least three core levels of operational activities and processes can be distinguished:

   i. *Value:* Most Business Model frameworks and Business Modeling approaches focus on the creation and exchange of value (e.g., Gordijn and Akkermans, 2001; Osterwalder, 2004), which can be tangible (such money, products) or intangible (e.g., knowledge, social cohesion, customer loyalty, image enhancement, or co-branding opportunities [Allee, 2000]).

   ii. *Information:* Although several scholars do not distinguish information and knowledge resources from other kind of value resources, for instance, within the resource-based view literature [Barney, 1991] (for more detail see chapter three, section 3.7). This non-trivial distinction underlines the prominent presence of knowledge and information resources in the contemporary businesses and its

fundamental role in creating value and gaining competitive advantages (Burk and Horton, 1988; Weill and Vitale, 2001), particularly, given the importance of ICT as enablers for new services and products (Bouwman *et al.*, 2005).

iii. *Business processes:* As discussed, the Business Processes describe how the company's' activities are carried out and how the activities are related to each other (Davenport, 1993). Companies, particularly in networked settings, are characterized by large number of processes of all kinds, belonging to different units and representing a wide range of internal and external activities. Porter (1985) divides a company's processes into primary and support processes. Similarly, Mooney *et al.* (1996) include operational and management processes in their typology. Accordingly, with regard to the Business Model/Business Operations alignment problem, this research recognizes the importance of the primary business processes (within and between stakeholders) as a powerful enabler (or show-stopper) of Business Model implementation.

In short, existing literature on Business Model and Business Operations lacks integrative approaches that facilitate the analysis of the conceptual gap between the two areas, from different levels of analysis, within networked-enterprise settings.

1.3 Research objective and Research question

In response to the conceptual gaps identified in the previous section, the aim of this study is:

> *"The development and evaluation of a framework that enables analysis of Business Model implementation, focusing on the alignment between Business Model and Business Operations of networked-enterprises, specifically in the Smart Living domain, taking into account multiple levels of analysis, as well as various components of networked collaboration."*

Such a framework should improve our understanding of Business Model implementation, by linking the business logic of networked enterprise to their underlying business operations, described by operational activities and processes at multiple levels of analysis (i.e., the exchange of value and information and business processes alignment among actors). To achieve the research objective, this study focuses on the following main research question:

> *"How can the gap between a Business Model and the underlying operational activities and processes among networked actors, within the Smart Living domain, be analyzed?*

To guide this study towards the desired end-state, four research questions need to be answered:

> **RQ 1**. *How can the Smart Living domain be described, how did the concept of Smart Living evolve over time, what are the main developments and trends in this domain?*

First, the research domain needs to be explored. Although the concept of Smart Living is predominantly technology-driven, by performing an extensive literature study, this study explores the existing knowledge on non-technological topics such as organizational and business/entrepreneurial concepts. The answer to this question will clarify how the relationship between Business Model and business operations are tackled within this domain.

> **RQ 2.** *What are core concepts related to Business Model and Business Processes (and the constituting and common components the two)?*

To understand and conceptualize the gap between Business Model and Business Operations, this study explores various streams of literature, including the body of knowledge on Business Model and its relationships to Business Processes and Enterprise/Business Architecture.

> **RQ 3.** *How can a multi-level and multi-actor link between both concepts (i.e., Business Model and Business Operations) be created?*

The theoretical insights gained in the previous step helps conceptualize the attribute space of an analytical framework that explicitly addresses multiple levels of analysis (e.g., various types of interactions and processes), and takes networked enterprises into account. In order to validate such an approach empirically, multiple case studies are needed to be executed. Accordingly, the final question is formulated as,

> **RQ 4.** *What can we learn from case studies that focus on Business Model/Business Operations alignment within the Smart Living domain?*

Through case studies, this study aims to provide an in-depth understanding and exploration of the gap identified above and a qualitative validation of the framework developed in the previous question.

The next section explains why a case study is the most appropriate research method, and how it helps answer the research questions and realizes the research objective.

1.4 Research philosophy and research approach

In line with the main research question and the research objective defined in the previous section, this study aims to (1) explore a theoretical gap, (2) propose a conceptual framework to fill the gap, and (3) empirically evaluate the proposed framework and its relevance within a predefined practical setting. While the first two steps rely primarily on theoretical reasoning based on the existing theories, the third step aims at inducing theory from empirical observation and specifying theoretical propositions. The inductive process adopts an explorative approach to discover the understanding and judgments of the actors involved, with regard to specific context (Corbin and Strauss, 1990) i.e., exploring and evaluating stakeholder opinions about Business Model/Business Operations alignment (or a lack thereof) and its impact on Business Model implementation within the context of networked enterprises, specifically in the Smart Living domain. The readily available theories related to Business Model and Business Operations help formulate several *sensitizing concepts*, which suggest a direction in which to look (Blumer, 1954), and which serve as a starting point for exploring and understanding the empirical data (Stübing, 2007).

At the moment, the theoretical debate on alignment between Business Model and the operational arrangements of stakeholders is still at an early stage of conceptualization and contextualization, or at a formative stage, as it has been called by Roethlisberger (1977), to which an explorative case study has been indicated as an appropriate research method (Roethlisberger, 1977; Benbasat, 1984; Bonoma, 1983). According to Benbasat *et al.* (1987, p.370), case studies can be used "*to answer how and why questions, that is, to understand the nature and complexity of the processes taking place*". As such, a detailed appreciation of the phenomenon and its context can be achieved (Cavaye, 1996; Benbasat, 1984). More specifically, the actors, their experiences and the complex context of actions can be scrutinized (Bonoma, 1983), which is in line with the underlying assumption of this study, that a networked-enterprise setting entails or implies complexity on both a business-related and operational side.

Concurrently, this study aims at revealing *generic* factors diluting alignment, by inducing and generalizing from context-based alignment issues (that exist in the observable reality). Yin (2003) argues that case studies are highly suitable when the boundaries between phenomenon and context are not fully clear (Yin, 2003). A multiple case study approach helps improve the external validity (the generalizability of the findings) (Yin, 2003). This approach comprises within-case analysis as well as cross-case comparison, which makes it possible "*to go beyond initial impressions of data, improving the likelihood of accurate and reliable theory*" (Eisenhards, 1989, p.541). On the basis of a set of criteria, driven via theoretical sampling (Yin, 1984), four Smart Living cases will be selected and explored. Figure 1.1 depicts how the different elements of this study are related to each other.

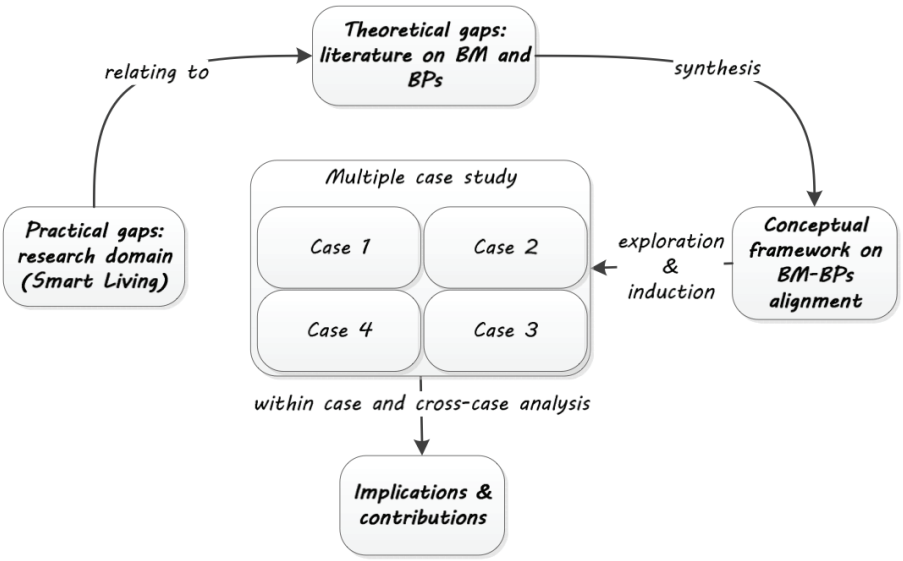


Figure 1.1 Outline of the research

By means of multiple semi-structured interviews with professionals from business and operations, this study examines the gap identified earlier within a real-life environment. In addition, as suggested by several scholars, this study applies data triangulation, i.e., an analysis of several documented data sources (e.g., Patton, 1987; Denzin, 1970; Miles and Huberman, 1994), the aim being to *"give a more detailed and balanced picture of the situation"* (Altrichter *et al.*, 2008, p.147) (for a detailed description on research methods, see chapter four).

1.5 Outline of this dissertation

This chapter introduced the problem under investigation from both a theoretical and practical point of view. Additionally, this chapter contains a brief discussion of the research domain, the relevant literature review and the research approach. As depicted in Figure 1.2, the next chapter provides a more detailed literature review concerning the Smart Living domain, including a retrospective of developments in this domain, exploring various areas of research and identifying gaps in the existing body of knowledge. Chapter three reviews the available literature on Business Model and

Business Operations, with the aim of conceptualizing the attribute space of the analytical framework.

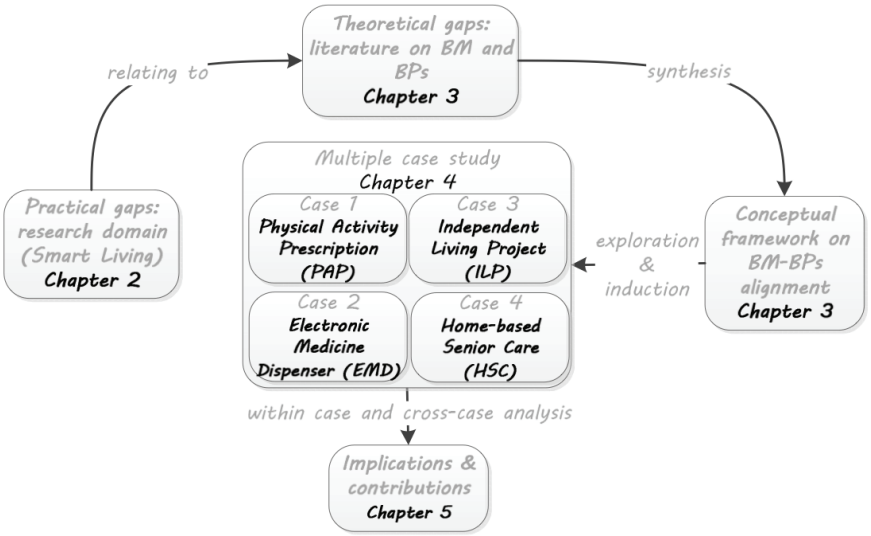


Figure 1.2 The chapters of this dissertation

The research method is explained in chapter four, including the case selection criteria, a description of four case studies (i.e., Physical Activity Prescription, Electronic Medicine Dispenser, Independent Living Project, and Home-based Senior Care) and the steps involved in analyzing the cases. In the same chapter, the within-case data analysis and the empirical findings are discussed. Chapter five draws conclusions based on the within-case analysis while chapter six conducts a cross-case analysis. Chapter seven explicates the theoretical contributions, the practical implications and the limitations of this research, in addition to providing a number of fruitful areas for further research.

Chapter 2. Research Domain

> *"[A] mediocre technology pursued within a great Business Model may be more valuable that a great technology exploited via a mediocre Business Model".*
>
> (Henry Chesbrough, 2010; p.354)

Along with technological advancements over the past 40 years, an exponentially growing interest from industry has caused the concept of Smart Home to evolve from Domotica, to the Smart Home, later to Internet of Things and Smart Living. Energy providers see opportunities for ICT-enabled smart energy applications. Telecom, Cable and Media companies, as well as hardware and content providers, see opportunities for an environment where the home will become an entertainment experience and gaming center. Access providers see opportunities for in-home managed IT services. Security providers see distant surveillance, control and safety equipment as an option for new business. Healthcare providers recognize opportunities for sensor networks connected to smart devices that enable the elderly and people with a chronic disease to stay in their personal environment longer, the aim being to cut costs in the medical care and healthcare domain. In addition, it may be needless to say that several disciplines (e.g., robotics, artificial intelligence, service engineering, mobile computing) are involved in this domain, while various perspectives (e.g.,

Parts of this chapter are published in the Journal of Design Research (JDR) and the Journal of Indoor and Built Environment (IBE). I highly appreciate the meticulous and constructive feedbacks of my colleagues Dr. Fernando Secomandi and Wally Keijzer-Broers, the anonymous reviewers and the assistance of journal editors, Dr. Henri Christiaans and Dr. Ina T. Klaasen (JDR), and Prof. dr. Chuck Yu (IBE). I, also, thank the blind reviewers and discussants of the 10th International ICOST conference (Montreal, June 2011) for their useful comments and suggestions on an earlier version of this chapter.

users, system, organizations) are considered to identify and study a myriad of (design) issues (e.g., usability, affordability, privacy and security, interoperability and standardization, collaboration). Accordingly, an ever-growing dispersed body of literature is in production. Although the concept has the unanimous goal of promoting comfort, convenience, security and entertainment of home residents, the burgeoning literature on Smart Home is utterly incoherent. In addition, the few well-structured review publications with the aim of representing the Smart Home body of knowledge either focus on technology aspects or on sector-specific developments. Examples are a review on assistive technologies (LoPresti *et al.*, 2004), e-health projects (Chan *et al.*, 2008; 2009; Koch, 2006), design requirements (Solaimani *et al.*, 2013), laboratories (Aldrich, 2003), technologies for aging societies (Demiris and Hensel, 2008), energy management (Kailas *et al.*, 2012), location-based systems (Ha *et al.*, 2007) and user studies in healthy Smart Homes (Kim *et al.*, 2013).

This chapter argues that, to move from the exploration towards the exploitation of Smart Home concepts, research needs to be based on a coherent body of knowledge that covers technological, organizational, economical and business-oriented (entrepreneurial) issues, from both a strategic and an operational perspective. The intended contribution of this chapter is twofold: (1) to analyze the existing mainstreams of Smart Home research topics, and (2) to initiate a discussion on research topics that warrant further attention. To this end, first an extensive number of publications on the Smart Home is collected and analyzed, and subsequently, areas that are frequently investigated and those that have thus far been neglected by researchers are identified and discussed. For the analysis, an inductive research strategy, as proposed by (Miles and Huberman, 1994) is adopted. The literature review starts from the four Business Model domains, i.e. Service, Technology, Organization and Finance (STOF), as distinguished by Bouwman *et al.* (2008). In the analysis provided in this chapter, the STOF framework serves as a comprehensive starting point from which the Smart Home publications is analyzed.

First, the chapter provides a short discussion of the Smart Home concept and proposes a working definition to determine the scope of the research domain, after which the diversity of the Smart Home domain is discussed. Next, the methodology for the literature review is described. Finally, the results are discussed, future challenges are outlined and the main conclusions and research limitations are presented.

2.1 Smart Home: definition and perspectives

Since the first official announcement of Smart Home in 1984 by the American Association of House Builders (Harper, 2003), the concept has been applied in different industries. As far as the healthcare sector is concerned, a Smart Home is interpreted as a residence that provides disease prevention possibilities, monitoring health and/or assisting with health-related issues of its inhabitants with the purpose of improving quality of health and healthcare (Chan *et al*., 2008; Demiris *et al*., 2004). Chan *et al*. (2009) discuss a number of e-health projects in the Smart Home area. In the construction (Domotica) sector, a Smart Home is seen as a house or living environment that contains the technology to allow devices and systems to be controlled automatically (Cong *et al*., 2013). Several Smart houses have been built to investigate smart technologies in urban dwellings (Chen and Chang 2009). The Energy sector associates the Smart Home with the efficient provision, co-production and consumption of energy (Fensel *et al*., 2013). Examples are Smart Meter projects that can be found all around the world, as discussed by (Park *et al*., 2011; Weiss *et al*., 2009). In line with the concept of Internet of Things, the Information and Communication Technology (ICT) sector focuses primarily on innovative ICT-enabled solutions designed to improve the connectedness of people and things, while also looking at entertainment and SoHo solutions.

In short, different industries use different definitions of Smart Homes. In this chapter, we use the broad definition provided by (Aldrich, 2003, p.1): "*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", and add *healthcare, education* and *communication* to his definition. The last part of Aldrich's definition, '*connection to the world beyond*', stresses the notion of the 'informational' home, where existing and new information services are interactively connected to the outside world, rather than the mere 'automation' of home appliances (Gann, Barlow and Venables 1999). The notion that Smart applications are not limited to the dwelling or home as such makes it clear that the term Smart Home is limited, and that the term *Smart Living* may be more accurate, indicating that Smart applications in a Home environment can be accessed remotely, or even distributed, and vice versa. In a similar vein, some publications focus on Smart Communities (Li *et al.*, 2011), Smart Cities (IBM[2]) and Smart Factories (Zuehlke, 2010), expanding the concept beyond the residential home.

Recent rapid-paced developments in technology in many areas, including ubiquitous computing (Goumopoulos and Kameas, 2008), intelligent appliances (Cook and Das, 2007), telecommunications (Keegan *et al.*, 2008), robotics (Ramos *et al.*, 2008), wearable sensors (Stefanov *et al.*, 2006) has created a new wave of interest in the Smart Living concept. A majority of Smart Living projects and publications adopt a technological perspective. Technology push clearly plays a role (Gann *et al.*, 1999; Peine, 2008). Others look at the Smart Living area from a user-centric perspective and see context and user demand as the leading factors for the development and provision of Smart Living concepts (e.g., Aldrich, 2003; Gann *et al.*, 1999; Venkatesh, 1996).

In short, Smart Living can be characterized as a research area that includes various industries, disciplines, and perspectives. The analysis in this chapter aims to provide a comprehensive view of how the body of knowledge in this domain has evolved, and moreover, what areas are in need of more attention from both scholars and practitioners.

[2] IBM Smart Cities: http://www.ibm.com/smarterplanet/us/en/sustainable_cities/visions/index.html

2.2 Research Method

2.2.1 Data Sources

Publications on Smart Living were identified through searches of three search engines, i.e., Google Scholar, Scopus, and Web of Science, for publications from 1991[3] to 2013. The search terms that were used were 'smart homes', 'smart living', 'ambient intelligence', 'intelligent homes', 'connected homes', and 'ubiquitous computing'. Publications from a wide variety of academic publishers, such as Elsevier's Science Direct, Emerald Library, Springer, JSTOR, ACM, IEEE Computer Society, Wiley InterScience, Information Society, Human Technology and ICST Institute for Computer Science, Social-Informatics and Telecommunications Engineering, were identified. The result was an extremely large sample of publications. However, there is a large overlap between search engines and publications. On one hand, the search engines index (almost) the same set of publications based on the search terms. On the other hand, the search terms result in an overlapping set of publications. To deal with the overlap and select relevant publications in accordance with the earlier discussed research goal, a set of selection criteria is formulated.

2.2.2 Publication Selection

The selection was based on three criteria. First, publications were selected that contain at least one of the search terms in the title, abstract and/or list of keywords. This criterion ensured the relevance of data collection as to be directly related to Smart Home domain. Second, only publications were selected that consider and explicate Smart Home as their unit of analysis. This criterion ensured the relevance of the data collection by including only those publications that aim at contributing to Smart Home literature, which led to exclusion of publications with a highly technical nature that essentially contribute to various technical disciplines such as information technology, telecommunication and network computing. And finally, to ensure scientific reliability of the data collection, only reviewed journals,

[3] From the publication year of the Mark Weiser's seminal work on intelligent interconnected devices.

book chapters and conference proceedings with more than 50 citations were selected. The Smart Home literature contains several broadly accepted and highly cited conference proceedings. Exclusion of these conference proceedings skews the representation of literature. A threshold of 50 citations was chosen to exclude the less prominent proceedings. Obviously, a higher or lower threshold would have been possible, leading to inclusion or exclusion of more or less publications (see research limitations in the final section).

After the selection round, an initial set of 138 publications was identified. Next, the publication references were screened (snow-ball sampling), yielding a total sample of 154 publications.

2.2.3 Data Structure

The final collection of publications was subjected to a full-length screening. All the papers were thoroughly scrutinized and the core concepts discussed in these publications were then summarized in a large database[4]. As recommended by Cochrane review approach (Higgins and Green, 2011), the database includes all the key information that enables the analysis of the landscape of Smart Home literature. The database includes seven columns including: (1) publication reference (including year of publication), (2) number of citations, (3) domain of study (e.g., security, energy efficiency, laboratory, interface), (4) research hypothesis or questions, (5) methodology, (6) theoretical concepts used in the publication, and (7) the design issues discussed throughout the paper (e.g., usability, context-awareness, adaptive [middleware], unobtrusive). The database was filled using the terminology and structure consistent with reviewed papers.

2.2.4 Abstraction Process

In line with the main goal of this study, the intended analysis of the existing publications needs to include various foci of analysis. As discussed in the previous sections, it is only through a comprehensive view on Smart Home literature, that the existing knowledge gaps can be identified and an

[4] The complete database of the selected Smart Home publications is available upon request.

effective research agenda can be articulated. To this end, we borrow a generic and comprehensive framework that aims at reconstructing the logic of a business and its surrounding ecosystem. The framework enables a high-level and holistic representation of Business Model by discussing Service, Technology, Organization and Finance (STOF) aspects (Bouwman *et al.*, 2008). The service domain offers a description of the value proposition (added value of a service offering eventually enabled by new products) and the market segment at which the offering is targeted. The technology domain describes the technical functionality and architecture required to realize the service offering. The organization domain offers a description of the structure of the multi-actor value network required to create, manage and distribute the service, and to describe the focal firm's position within this value network. The finance domain gives a description of the way a value network intends to generate revenues from a particular service offering and of the way risks, investments and revenues are divided among the different actors in a value network. The main merit of this framework is its multidimensional view that includes both technological and non-technological aspects.

The four STOF domains were used as the starting point to 'cluster' existing Smart Living literature (Miles and Huberman, 1994, p.249). To do so, first off all the papers were categorized into one or more dimensions of STOF, i.e., service, technology, organization, and finance (which added a new column to the database indicating point of focus). The categorization is based on research objectives and topics addressed in the papers. Next, the papers were coded based on research subjects, questions, domain, and method. Whenever a new category or subcategory was identified, the labels were divided and subdivided in a new hierarchical structure. Gradually, the STOF classification of publications evolved into a more detailed tree of topics, with branches and sub-branches. As suggested by Miles and Huberman (1994), each article forces the researchers to reconsider the tree and its branches, and adapt (i.e. modify, refine or detail) where needed. Although an attempt was made to distinguish unique clusters, some clusters were strongly interrelated or even overlapping. Therefore, in some cases clustering is based on the central theme of the paper at hand, i.e., the codes

that that were repeated throughout the paper. The authors structured the tree of topics in accordance with the structure of the original papers (i.e., terminology, position of concepts within the tree, and the hierarchy of the concepts). To increase the internal validity, the publications, codes and clusters were reviewed by the author of this thesis and by co-researchers, and discussions took place to reconcile conflicting and to reach a consensus on the final clustering, design and the hierarchical order of the tree (Miles and Huberman, 1994). The next sections contain the results of the analysis.

2.3 Results

In this section, the clusters for the four domains are discussed. In total, 15 core clusters and 52 sub-clusters were identified. For the sake of brevity, Figure 2.1 illustrates a concise representation of the clusters. In the remainder of this section, sub-clusters will be presented. Note that defining and providing extensive discussion on various concepts lies beyond the scope of this chapter. Instead, the chapter aims to reflect a comprehensive representation of the existing structure of Smart Home literature.

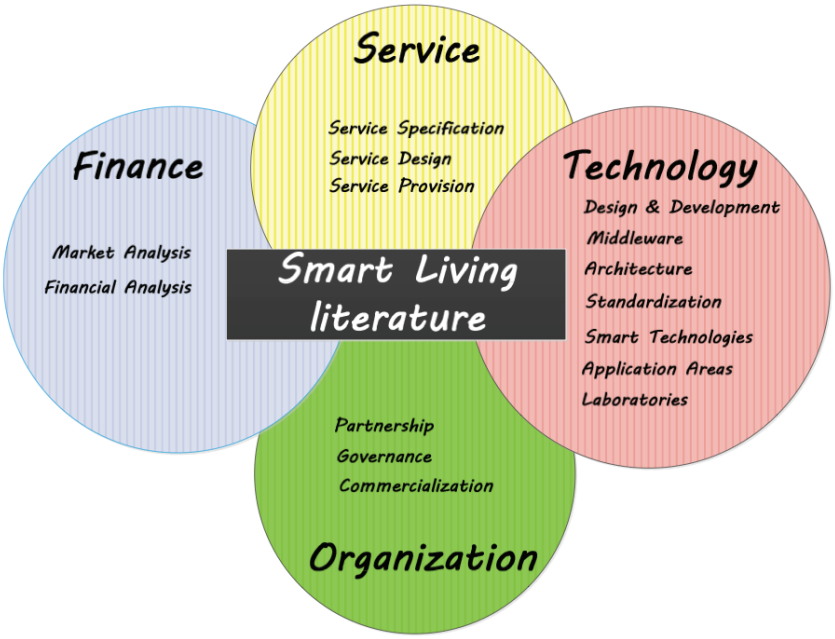


Figure 2.1 A concise representation of the current Smart Home literature

2.3.1 Service domain

The service domain describes the customer value of a product of service offered by (a) provider(s). The customer value is determined by non-technical elements, like value proposition, service delivery, and distribution channels or after-sales services. Within the service domain, three main clusters are identified: service specification, service design and service provision. In general, publications within the first cluster are concerned with service definition or engineering (i.e., what services should be delivered?), service design focuses on non-technical analysis of user demand, while publications in service provision aim at answering 'how services should be delivered (and what can be expected)?' Table 2.1 presents the identified topics related to each cluster, the related concepts and the application area for each topic. A number of sub-branches such as usefulness and ease-of-use are typical design/development (i.e., usability) topics, which is discussed in the next section. However, the emphasis on the non-technical topics distinguishes the service from the technology perspective. For instance usability, in terms of understanding the user context based on ethnographic observations (Randall, 2003, Tolmie *et al.*, 2002), instead of developing context-oriented sensors or architecture; or users service non-functional requirements (García-Herranz *et al.*, 2008), instead of technical system requirement elicitation (Hong *et al.*, 2005).

Table 2.1 The service dimension

Clusters	Topics	Instantiations	References
Service Specification	Service value	Value proposition	Barlow and Venables, 2003; Guo, Zhang and Imai, 2010
	Service types	Generic/ specific services, living space, social space, physical space, etc.	Gann, Barlow and Venables, 1999; Venkatesh, Kruse and Shih, 2003
	Service quality	Service quality requirements	García-Herranz *et al.*, 2008
	Service flexibility	Reusability, expandability, etc.	Wu *et al.*, 2007; Taylor and Swan, 2005
Service Design	Service usefulness	Service adoption and control	Leppänen and Jokinen, 2003
		Service or product personalization	Taylor *et al.*, 2007
		(Ethnographic) understanding of user context	Randall, 2003; Tolmie *et al.*, 2002; Lyons *et al.*, 2010; San Martín *et al.*, 2010

		User experience	Alves Lino, Salem and Rauterberg, 2010
Service Provision	Service demand	User service requirements	Taylor and Swan, 2005
		User expectation	Pragnell, Spence and Moore, 2000; Biswas *et al.*, 2010; Bayer, Barlow and Curry, 2003; Brink and Bronswijk, 2013
	Service delivery	Environmental-friendly service provisioning	Aarts, 2004
		Service distribution channels	Gann, Barlow and Venables, 1999

2.3.2 Technology domain

The technology domain contains the largest number of publications, and discusses a large number of technical-related topics. These topics are the enablers or driving force behind many Smart Home innovations. The seven central clusters that are identified in this domain are design and development, middleware, architecture, standardization, smart technologies, application areas, and laboratories (Table 2.2). The first cluster focuses on various design issues, discussing various issues related to usability including usefulness, ease of use, user context, and design methods and principles. The middleware cluster focuses on various types of middleware technologies applicable in various environments, such as service-oriented, goal-oriented, agent-based, and location-based. In a same way, various architectural approaches are proposed to deal with software, services, middleware, networks, systems and etc. Standardization is another cluster that includes a high-level discussion on the importance, limitations, impact or consequences of (a lack of) standardization, as well as technical discussion on various standards and protocols. In addition, several publications emphasize various promising smart technologies and areas where these technologies may be applied. Finally, several publications present Smart Home laboratories, experiments conducted in these laboratories, and the way these laboratories are developed.

Table 2.2 The technology dimension

Clusters	Topics	Instantiations	References
Design and Development	Usefulness & ease-of-use	Sense of control	Ramos *et al*., 2008, Davidoff *et al*., 2006
		Local and distance connectivity	Randall, 2003
		Social connectivity	Harper, 2003
		Laborsaving qualities and good parenting facilities	Edwards and Grinter, 2001
		Assistiveness	Rialle *et al*., 2002; Curry *et al*., 2002
		Part of life	Taylor and Swan, 2005; Streitz *et al.*, 2005; Allameh *et al.*, 2012
		Easy installation or control, and satisfaction	Gann *et al*., 1999
		Privacy and security	Friedewald *et al*., 2007; Leppänen and Jokinen, 2003
	User context	Interface (motion tracking, gesture recognition, and speech)	Krebber and Pegam, 2008
		Interface personalization	Mäyrä *et al*., 2006
		Detection/recognition of human intentions, feelings, situations, and activities	Das *et al.*, 2002; Yamazaki, 2006; Fleury *et al*., 2010; Jalal *et al.*, 2012; 2013; Chen *et al*., 2012; Fahim *et al.*, 2013; Fatima *et al*., 2013
		User habits and personality	Friedewald *et al*., 2005
		User behavior	Wood and Newborough, 2007; Rashidi and Cook, 2009
		Requirement elicitation for context-aware design	Durrett *et al*., 2002; Hong *et al*., 2005
	Design methods	A framework for user-centric design	Durrett *et al*., 2002
		A framework for Critical Design Issues	Solaimani *et al*., 2013
		A framework for	Leitner *et al*., 2007

		design factors	
		A framework for human-system interaction	Wu and Fu, 2012
	Design principles	Reliability and manageability	Edwards and Grinter, 2001
		Agility consisted of flexibility, upgradability, replicability, adaptability	Gann *et al*., 1999
		Extensibility, maintainability	Barlow and Venables, 2003
		Non-obtrusive, adaptability, anticipatory	Aarts, 2004; Shadbolt, 2003
		Scalability	Basten *et al*., 2003
Middleware	Location-aware services		Helal *et al*., 2003; Roy *et al*., 2003; Huebscher and McCann, 2004; Cook and Das, 2007; Liu, 2010
	Context-aware middleware		Ranganathan and Campell, 2003; Huebscher and McCann, 2004; Gu, 2005; Goumopoulos and Kameas, 2008; Hong *et al*., 2009
	Ontology-based middleware		Gu, Wang, and Pung, 2004; Gu, 2005
	Agent-based middleware		Cook *et al*., 2003; Soldatos *et al*., 2007
	Goal-oriented middleware		Amigoni *et al*., 2005; Encarnação and Kirste, 2005
	Service-oriented middleware		Ricquebourg *et al*., 2006; Gu *et al*., 2005
Architecture	Software-architecture		Gu, 2005
	Interoperability architecture		Park *et al*., 2003; Li *et al*., 2011
	Service-architecture		Wu *et al*., 2007; Gu *et al*., 2005
	Middleware-architecture		Helal *et al*. 2005; Gu *et al*., 2005
	Logical-architecture		Noury *et al*., 2003
	Network-architecture		Skubic *et al*., 2009
	System-architecture		Cong *et al*., 2013
Standardization	Interoper-ability	Interoperability benefits	Gann *et al*., 1999; Jahnke *et al*., 2002; Cook and Das, 2007; Allen, 1995

	Protocols	OSGi, ZigBee[5], KNX, IEEE 1451, IEEE 802.11, MAC, P2030[6], Open Services Gateway Initiative[7], Bluetooth, etc.	Valtchev and Frankov, 2002, Sriskanthan *et al*., 2002; Lin and Tseng, 2002; Ricquebourg *et al*., 2006; Lin *et al.,* 2002; Marple and Kriens, 2001
Smart Technologies	Network technology	Body Area Network	Cao *et al*., 2009
		Personal Area Network	Jones *et al*., 2001; Li *et al*., 2011
		Cloud computing network	Cheng and Chang, 2009
	Communication and control	Home-remote control, Energy management	Helal *et al*., 2005; Valtchev and Frankov; 2002; Nicholas and Myers, 2006; Han and Lim 2010a,b; Ornetzeder and Rohracher, 2006; Cook and Das, 2007; Cetina *et al.,* 2009
		Alarm systems	Rialle *et al*., 2002
		Authentication system	Ali Fahmi *et al*., 2013
	Sensor technology	Wearable technologies	Demongeot *et al*., 2002; Stefanov *et al*., 2006; Aarts and Wichert, 2009; Cook *et al*., 2009
		Pattern, emotion, or biometric recognition	Menon *et al*., 2010; Drungilas and Bielskis, 2012; Fahim *et al*., 2013; Fatima *et al*., 2013
		Motion sensor, object tracing	Amirjavid *et al*., 2012; Castello *et al.* 2013
	Artificial intelligence	Robots	Coradeschi and Saffiotti 2006; Ramos *et al*., 2008; Qian *et al*., 2012
Application Areas	Healthcare	Assisting care, social care, physical care	Rialle *et al*., 2002; Curry *et al*., 2002; Noury *et al*., 2003; Demiris *et al*., 2004; Ha *et al*., 2007; Chan *et al*., 2008, 2009; Charlon *et al*., 2013
	Medical	Schizophrenia, Alzheimer	Stip and Rialle, 2005; Amirjavid *et al*., 2012
	Energy and sustain-ability	Smart metering, energy control, energy management,	Marvin *et al*., 1999; Wood and Newborough, 2007; Weiss *et al*., 2009; Han and Lim, 2010a,b; Pedrasa *et al*., 2010; Park *et al*., 2011; Hong *et al*., 2009; Gungor *et al*.,

[5] ZigBee: http://www.zigbee.org/

[6] P2030: http://grouper.ieee.org/groups/scc21/2030/2030_index.html

[7] OSGI: www.osgi.org

		smart grid, sustainable-energy technologies	2012; Tsui and Chan, 2012; Kamilaris *et al.*, 2013; Nucci *et al.*, 2013
	Education	Tele-education	Shi *et al.*, 2003
	Home automation	Air quality and thermal comfort	Vázquez *et al.*, 2013; Kim *et al.*, 2013
	e-Commerce	Shopping, Smart Factories	Keegan *et al.*, 2008; Zuehlke, 2010
	Gaming	Indoor pervasive games	Guo *et al.*, 2012
	Telecommu nication	Mobile applications	Keegan *et al.*, 2008
Laboratories	Laboratory develop-ment	Design methods	Junestrand *et al.*, 2001; Tolmie *et al.*, 2002, Nugent *et al.*, 2008; Surie *et al.*, 2010
	Laboratory experiments	Aware Home	Kidd *et al.*, 1999
		comHome	Junestrand *et al.*, 2001
		MavHome	Das *et al.*, 2002; Cook *et al.*, 2003
		Orange at Home	Harper, 2003
		LIVEFutura	Ringbauer, 2005
		PlaceLab	Intille *et al.*, 2005; Intille, 2006
		The Gator Tech Smart House	Helal *et al.*, 2005
		Vallgossen	Sandström *et al.*, 2005
		iHome	Gu, 2005
		House-n-Consortium	Intille *et al.*, 2006
		Ubiquitous Home	Yamazaki, 2006
		Easy ADL Home	Surie *et al.*, 2010
		Chicago Greenhouse	Jing and Jiang, 2012

It is striking that despite the large number of publications on architecture almost nothing could be found with regard to business or enterprise architecture. The same applies to business operations, including business process modeling, management, and optimization.

2.3.3 Organization domain

Generally speaking, the design, development and provision of a service or product require the involvement of organizations from various sectors, each with their specific resources and capabilities. The providers involved work

together, not only to complement each other, but also to create value for their customers in a way that would otherwise not be possible.

Table 2.3 The organization dimension

Clusters	Topics	Instantiations	References
Partnership	Coordination	Tight versus loose	Peine, 2008
		Multidisciplinary projects	Remagnino and Foresti, 2005
		Collective action	Nikayin and De Reuver, 2013
		(Common) service platform	Nikayin and De Reuver, 2013; Ricquebourg *et al*., 2006
	Joint R&D	Companies joint R&D activities	Curry *et al*., 2002
		Academia-industry relationship	Hindus, 1999
Governance	Social implications	Ethical and legal issues	Chan *et al*., 2008; Frisardi and Imbimbo, 2011
		Privacy and security	Leppänen and Jokinen, 2003; Calvert *et al*., 2011
	Eco-system management	Responsibility and dependency created by services	Stip and Rialle, 2005
		Technological and organizational alignment	Kinder, 2010
		Role division	Barlow and Venables, 2003
		Open versus close innovation	Kinder, 2010
		Key players	Gungor *et al*., 2012

The organization domain focuses on topics that are relevant to the emergence and governance of such value networks. As presented in Table 2.3, within the scope of this domain, three clusters are identified: partnership, governance, and commercialization. Partnership focuses on the creation of collaborative networks, governance focuses on managing the project or maintaining and sustaining the networked providers, and commercialization focuses on creating, exchanging and capturing value from and for the (networked) stakeholders. Existing literature appear not to include any discussion on Business Modeling, the exchange of resources and capabilities and processes in networked settings, and the alignment in-between.

2.3.4 Finance domain

The financial arrangements between all actors of ecosystem (i.e. providers, suppliers, manufacturing, customers etc.) are the bottom line of the finance domain. Topics such as revenue, cost, investments, financial risks and pricing are some of the typical elements of the finance domain. Within this domain, two core clusters are identified: market analysis and financial analysis (Table 2.4). The first cluster focuses on the market demand and financial dynamic, and the second cluster centers around the financial arrangement of provider(s), the intended services or products, and the impact of investments.

Table 2.4 The finance dimension

Clusters	Topics	Instantiations	References
Market analysis	User lifestyle	The structure of families and their daily routines	Bierhoff *et al.*, 2007; Leppänen and Jokinen, 2003
	User demographic characteristics	Working-class neighborhood, etc.	Barlow and Venables, 2003
		Aging population	Stefanov *et al.*, 2006
	User type of housing	Rental home, new or old housing, elderly home, etc.	Gann *et al.*, 1999
	User spending power	Dual or single income, number of inhabitants, etc.	Davidoff *et al.*, 2006
		Service/product affordability (e.g., legacy systems, modular services, the initial costs)	Pragnell *et al.*, 2000; Aldrich, 2003; Barlow and Venables, 2003
Financial analysis	Investment impact	Short-term and long-term effects	Bayer *et al.*, 2007
		Efficiency (cost reduction)	Jahnke *et al.*, 2002; Korhonen *et al.*, 2003; Friedewald *et al.*, 2005; Fensel *et al.*, 2013
		Green investment	Hledik, 2009; Ornetzeder and Rohracher, 2006
	Financial feasibility	Risk management	Barlow and Venables, 2003
		Business case (e-commerce)	Pragnell *et al.*, 2000;Keegan *et al.*, 2008
		Cost/benefit analysis	Pragnell *et al.*, 2000; Bayer *et al.*,

			2007; Faruqui *et al.*, 2010
		Cost saving	Stefanov *et al.*, 2006; Rialle *et al.*, 2002; Aarts and Encarnação, 2006; Paetz *et al.*, 2012

2.4 Discussion

At a first glance, the disproportionate distribution of the four clusters attracts attention. The technology domain is by far the most prevalent domain, characterized by a high-level of detail, as indicated by the multi-layered clusters and multiple publications on the same or similar topics. By contrast, non-technological topics have attracted far less attention from Smart Living researchers. Most of the topics in non-technological domains are covered as side issues, mainly in a few publications. This means that, in line with the repeated reminder of several researchers, the Smart Living domain is still primarily dominated by *technology push* (Aarts and Encarnação, 2006; Aldrich, 2003; Gann *et al.*, 1999). However, there is one exception. From service engineering perspective, the literature on user-centric design occasionally performs social and psychological analysis on users behavior. However, even this stream of literature is often closely related to, if not dominated by, technical requirements analysis and technology development (Davidoff *et al.*, 2006; Intille *et al.*, 2006; Taylor and Swan, 2005). A chart is generated based on the collected publications (Figure 2.2). The chart shows an exponential growth[8] of studies and publications on technology-related topics, in the last decade. However, attention to organizational and financial domains is relatively scant. The expectation is that the actual recent growth of publications is even greater, as journal articles need time to be reviewed and accepted, and conference papers need to be cited.

[8] Expect for 2003, when the Harper's book (Inside the Smart Home) appeared. The book is a collection of articles that discuss, in contrast to the established technology-driven traditions, various service-related topic.

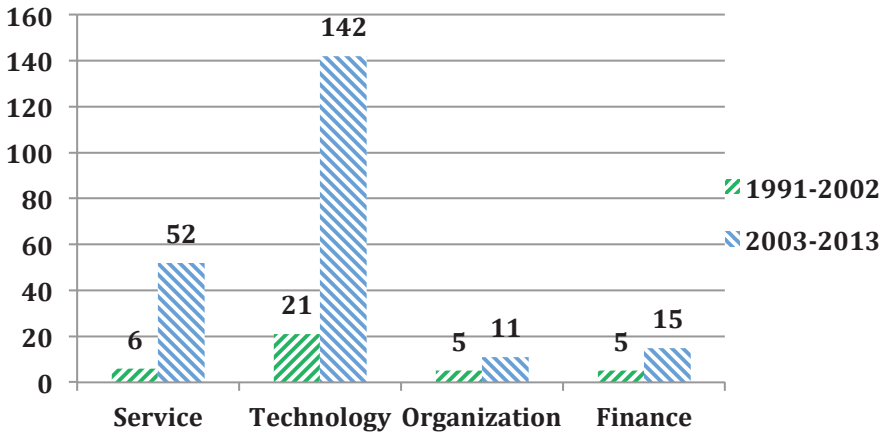


Figure 2.2 The collected articles divided into four STOF domains (n=154)[9]

Various explanations can be offered for the lack of attention to more socio-technical and socio-organizational issues. First of all, the Smart Living domain is still the domain of technicians, and therefore, the technical-related challenges have a higher priority. Next, it is easier to acquire funding to conduct technical research and experiments. The EU FP7 program, for instance, funds a number of projects regarding Smart Living and eHealth with a strong focus on technology, to be accepted by mono-disciplinary technical publications. In line with this, there are more technical-oriented conferences and conference tracks, which again stimulates a focus on technical issues, experiments and publications about technology. This is a typical example of positive network externalities. Finally, Smart Living projects and experiments are predominantly conducted within a R&D environment. The fact that Smart Living, as an industry, is still in its exploratory phase (Gilsing, 2003) can explain the relative absence of socio-technical, socio-organizational and economic studies. On the other hand, the fact that many Smart Living concepts are not commercially exploited makes

[9] The diagram divides the uneven total number of 23 years, between 1991 and 2013, into two clusters of periods of 12 and 11 years, respectively. To reverse the clusters to the STOF bars need to be adjusted based on publications from 2002 (i.e., 0 for service, 7 for technology, 2 for organization, and 2 for finance). This adjustment does not change the general pattern of publications.

it clear that there must be plenty of strategic, organizational and financial issues that require further attention.

The analysis put various areas forward for further research. From an organizational perspective, several promising topics that have thus far been overlooked can be recommended, one of which is the initiation of strategic collaboration in a networked-enterprise setting, for instance to how the collective action theories may be useful in networked-enterprise collaborations in the Smart Living domain. How to motivate actors to initially invest time and effort while the benefits only can be reaped in the long run. How do issues like a lack of trust between core actors who have to collaborate to provide Smart Living hinder the realization of Smart Living projects. From a service marketing and design perspective, an evaluation of the actual market demand is a fruitful area for investigation. Most studies so far have a design-driven character that is highly focused on user requirements, rather than being interested in the service demand or willingness to pay and other financial issues. Some crucial questions in this regard are how big are the Smart Living target groups, who are actually interested in different Smart Living concepts, and what characteristics can be attributed to these groups? From a strategic ecosystem perspective, research questions with regard to the role of dominators or key players are relevant. From a business management perspective, it is essential to investigate how viable and feasible Business Models can be formulated and how these collaborations can be facilitated in such a way that it can be sustained at an operational level as well. The alignment between high-level (collective) Business Model and the operational business processes of service providers becomes a vital issue. Some relevant questions in this regard are how values and information resources are exchanged between the providers and how the underlying business processes are interrelated. Clearly, there are many areas that require further attention.

2.5 Conclusion

Despite the enormous technological advancements in recent years (Aarts and Encarnação, 2006), the vision Mark Weiser introduced two decades ago (1991), of a world where tons of interconnected intelligent devices and networks serve human in an unobtrusive way, has yet to become a reality. It is rather clear that an anthropomorphic human-machine interaction (Remagnino and Foresti, 2005), where computers are an extension of human beings, remains firmly in the future and has yet to materialize (Peine, 2008; San Martín *et al.,* 2010; Shadbolt, 2003).

The aim of this chapter is to argue that, to live up to expectations and to realize a large-scale commercialization, the Smart Living (or Smart Home) domain has to reach a higher level of maturity, which can only be done by identifying, analyzing and leveraging a wide range of aspects, not limited to technological domain only, but more focused on Business Model aspect, taking into account strategic, business, organizational, financial, and operational issues. This message echoes with the Teece's (1986) "profiting from innovation" model, which suggests that a technology is not sufficient to commercialize an innovation, unless accompanied by complementary assets, such as marketing, after-sales, competitive manufacturing, and distribution network.

In contrast, the exploratory review of an extensive collection of publications on Smart Living publications provided in this chapter reveals that technology-driven publications indubitably outnumber those in the non-technology domains.

The analysis performed in this chapter has also several limitations, one of which is the fact that the publications that were examined do not include all the existing publications related to the Smart Living. Therefore, in all probability, not all the concepts and items are discussed in detail. Furthermore, although the author and co-researchers attempted to adopt the structure with which concepts are presented in the publications, in some cases, the tree of topics and their branches were ordered based on the

authors collective interpretation. It means that some clusters and their underlying items could be renamed, replaced or divided into more sub-items. Also the hierarchical structure of branch and sub-branches can be rearranged. Nevertheless, this chapter argues that including more publications, labeling concepts differently or replacing, merging or re-organizing the proposed structure will not lead to different conclusion. To move from the embryonic stage of exploration to exploitation, the Smart Living researchers and practitioners need to recognize that merely smart technologies are not enough, our attention for social, technology, organizational, entrepreneurial and economical aspects needs to be well-proportioned. Or, as worded by Chesbrough (2010; p.354): "*a mediocre technology pursued within a great business model may be more valuable that a great technology exploited via a mediocre Business Model*".

As apparent from this chapter the literature on Smart Living cannot be of any help when it comes to the organizational aspect of innovation commercialization, and more specific, Business Model implementation within networked enterprise environments (see research question formulated in chapter one). The next chapter discusses the relevant theories in this regard, and proposes a framework to analyze the operational feasibility of Business Models, which will be evaluated in multiple Smart Living cases (see chapter 5).

Chapter 3. Theoretical framework

> *"…[W]e are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size."*
>
> Attributed to Bernard of Chartres (Salisbury, 1159)

In order to realize the research objective presented in chapter 1 (section 3), the research question (proposed in the same chapter) needs to be explored. The research question contains several concepts (including Business Model, Business Processes and Networked Enterprise), which this chapter will scrutinize.

3.1 Introduction

In many entrepreneurial projects, the concept of Business Model is used to describe the envisioned business idea at a high-level and in a holistic way.

A modified version of this chapter is published in Business Process Management Journal (BPMJ) in 2012. I would like to express my gratitude to the anonymous reviewers and the assistance and feedback of Prof. Majed Al-Mashari, the editor of the journal, for their feedback that greatly helped me improve the paper. Various parts of this chapter are presented in several conferences. I am highly thankful to Prof. Michael Rosemann and Prof. Peter Green for their valuable comments during the 21st ACIS (Brisbane, December 2010), the panel of Hefei University of Technology at the 1st BITs Conference (Hefei, December 2011), and Prof. Ulrike Lechner and Dr. Peter Lindgren at the 25th Bled Conference (Bled, June 2012). Above all, I would like to extend my sincere thanks to Prof. Henry Chesbrough and Prof. Wim Vanhaverbeke for their constructive feedback during the Open Innovation and Open Business Model workshop in at ESADE (Barcelona, January 2013) and certainly during my stay at Haas School of Business (UC Berkeley, Aug-Dec 2013).

Magretta (2002, p.3) states that a Business Model is "*essential to every successful organization, whether it's a new venture or an established player*". The increasing body of knowledge on Business Models (see Osterwalder *et al.*, 2005; Pateli and Giaglis, 2004; Zott *et al.*, 2011) indicates that a growing community of scholars shares that view. However, despite increasing attention, literature on Business Model has remained in a conceptual realm, focusing on definition, classification, typology and ontology (see the next section for a list of references), while at the same time largely ignoring the question of how a Business Model should be implemented in a viable and feasible manner (Al-Debei and Avison, 2010; Bouwman *et al.*, 2008; 2012; El-Sawy and Pereira, 2013; Teece, 2010). Accordingly, questions at the core of Business Model implementation, such as what makes a Business Model feasible, which design or success factors do explain its feasibility, how to enhance or sustain feasibility, have not been explored in greater depth. This, in turn, leads to a considerably limited understanding of the gap between Business Model design and implementation (Bask *et al.*, 2010). This gap is even bigger when networked enterprises, which involve a multitude of complex and heterogeneous inter-organizational interactions and interdependencies, are studied (El-Sawy and Pereira, 2013; Haaker *et al.*, 2006), which are typical in Smart Living projects (see previous chapter). This chapter argues that to ensure Business Model feasibility, the Business Models need to be coherent, supporting and be supported by the operational activities, processes and systems within and among stakeholders involved.

The remainder of this chapter is structured as follows. First, the concept of Business Model (section 3.2) and its position between strategy and operations (sections 3.3) is discussed. Section 3.4 elaborates on business process literature. Section 3.5 discusses the literature on networked enterprise, and provides a working definition to be used throughout the thesis. In this section, the inherent complexity of networked enterprise is also discussed. The existing approaches that may be potentially useful to align the Business Model with business operations are presented, and their shortcomings are argued in section 3.6. To understand and analyze the alignment between Business Model and business operations, particularly

within networked enterprise settings, section 3.7 proposes a generic model, called the Value, Information and Processes (VIP) framework. The VIP framework combines theories from several disciplines to provide a comprehensive understanding of the business and operational aspects of Business Model, especially within a networked enterprise environment, as typically found in Smart Living domain. In line with complex system theories, section 3.8 discusses how networked enterprises and the inherent inter-organizational interactions and processes may become complex systems. Finally, section 3.9 concludes with a discussion on the framework application and applicability.

3.2 Business Model

The concept of Business Model has been investigated and used by many scholars and practitioners from various disciplines and contexts, which has resulted in a wide variety of definitions (e.g., an overview is provided by Osterwalder *et al.,* 2005; Pateli and Giaglis, 2004; Perkmann and Spicer, 2010; Zott *et al.,* 2011). Yet, it is hard to find a clear-cut definition (Shafer *et al.,* 2005; George and Bock, 2011; Zott *et al.,* 2011). Generally speaking, the term a Business Model refers to a description or model that represents a firm's logic to create, provide and capture value from and for its stakeholders (e.g., Bouwman *et al.,* 2008; Chesbrough and Rosenbloom, 2002; Gordijn and Akkermans, 2001; Linder and Cantrell, 2000; Magretta, 2002; Petrovic *et al.,* 2001; Timmers, 1998; Weill and Vitale, 2001) (For more definitions see chapter 1.2).

The ever-growing body of knowledge regarding Business Model has been classified by numerous scholars (Pateli and Giaglis, 2004; Alt and Zimmermann, 2001; Afuah and Tucci, 2003; Osterwalder *et al.,* 2005), and many ontologies, taxonomies and frameworks are provided (Al-Debei and Fitzgerald, 2010; Bouwman *et al.,* 2008; Osterwalder and Pigneur, 2002; Gordijn and Akkermans, 2001; Chesbrough and Rosenbloom, 2002; Mahadevan, 2000). Several authors have attempted:

- To provide an overview of the body of knowledge regarding Business Models (e.g., Al-Debei and Avison, 2010; Baden-Fuller and Morgan,

2010; Morris *et al.,* 2005; Pateli and Giaglis, 2004; Shafer *et al.,* 2005; Zott *et al.,* 2011),

- To give insight into Business Model typologies (Malone *et al.,* 2006; Rappa, 2000; Tapscott *et al.,* 2000; Timmers, 1998; Weill and Vitale, 2001),
- To classify various Business Models (Afuah and Tucci, 2003; Alt and Zimmermann, 2001; Pateli and Giaglis, 2004; Shafer *et al.,* 2005),
- To examine the Business Model concept within various contexts, such as, the software industry and eGoverment (Al-Debei and Avison, 2010), Business Model for corporate-NGO collaboration (Dahan *et al.,* 2010), Business Model and societal wealth (Thompson and MacMillan, 2010), Business Model and service-oriented architecture (Dorn *et al.,* 2009), Business Model and strategic reasoning (Samavi *et al.,* 2009) and Business Model in bio-pharmaceutical industry (Sabatier *et al.,* 2010),
- To discuss Business Model innovation (Gambardella and McGahan, 2010; Chesbrough, 2006, 2007, 2010; Doz and Kosonen, 2010; Sosna *et al.,* 2010; Comes and Berniker, 2008; Hwang and Christensen, 2008), or,
- To develop Business Model ontologies, including, the Business Model Components (Cherbakov *et al.,* 2005), the STOF model (Bouwman *et al.,* 2008), the C-Soft (Heikkilä *et al.,* 2010), the Business Model Canvas (Osterwalder and Pigneur, 2010) and the conceptual Business Model approach proposed by Hedman and Kalling (2003), George and Bock (2011), Timmers (1998) and Shafer *et al.* (2005).

Most publications on Business Models adopt a business/strategic perspective, concerned with high-level conceptualization (i.e., discussing and comparing, as well as introducing more definitions, typologies, ontologies, classifications, etc.). However, more and more scholars and practitioners acknowledge the need to shift the focus towards Business Model implementation, and develop approaches to analyze Business Model viability and feasibility (Al-Debei and Avison, 2010; Bouwman *et al.,* 2008; El-Sawy & Pereira, 2013; Morris *et al.,* 2005; Teece, 2010). Business Model viability and feasibility can be analyzed from various viewpoints, by zooming in on strategic alignment, organizational fitting, financial feasibility and operational implementation. In line with the research goal and research

question presented in chapter 1 (section 3), the focus of this research is on Business Model implementation and its operational feasibility, focusing on the gap between Business Model design and implementation (represented by operational business processes and activities). According to Teece (2010), due to our lack of understanding of Business Model implementation, great technological projects fail to reach the market. As discussed in the previous chapter, the problem of market commercialization is exactly one of the crucial issues that Smart Living service and product providers are struggling with.

3.3 Business Model: a linking layer between strategy & operations

Business Model is not a self-sufficient concept; it needs to be positioned as an intermediate layer between business strategy and business processes (Al-Debei and Avison, 2010; Cavalcante *et al.*, 2011; Morris *et al.*, 2005; Osterwalder *et al.*, 2005), or in the words of Bask et al. (2010) between the (business/strategic) planning level and implementation level. While a Business Model does facilitate the analysis, testing and validation of a firm's strategic choices, it is not in itself a strategy (Shafer *et al.*, 2005). Strategy refers to which Business Model a firm will use to compete in the marketplace (Casadesus-Masanell and Ricart, 2010). In Porter's (1980) view, strategy is a way by which a business organization positions itself within its industry by adopting one of the following generic strategies: cost leadership, differentiation or market segmentation. According to Teece (2010, p. 180) "*strategy analysis is an essential step in designing a competitively sustainable business model*", while "*business model is a reflection of the firm's realized (e.g. implemented, author of this thesis) strategy*" (Casadesus-Masanell and Ricart 2010, p.196), as expressed through a Business Model ontology.

A debate on the relationship between business strategy and Business Model lies beyond the scope of this research (see the special issue published by Long Range Planning - Special Issue on Business Models, Vol. 43, Issue 2-3). Instead, this research focuses on the intersections between Business Model and Business Processes (Figure 3.1).

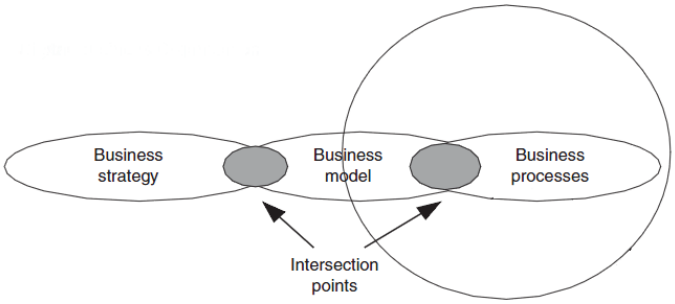


Figure 3.1 Business Model intersection points (c.f. Al-Debei and Avison, 2010)

3.4 Operational Business Processes

While a Business Model describes *what* a business should do to create value, *how* this is (or can be) done requires an in-depth understanding of the underlying Business Operations. In different words, the implementation of a Business Model is enabled and carried out by operational activities and processes at various organizational levels (Al-Debei and Avison, 2010; Bask *et al.,* 2010; Bouwman *et al.,* 2008). A broadly accepted definition is provided by Davenport (1993), who define a process as "*a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs: a structure for action*", which have "*performance dimensions- cost, time, output quality, and customer satisfaction- that can be measured and improved*" (Davenport, 1993, p.5). Lindsay *et al.,* (2003) argue that business process can be described by their properties, characteristics and functions. Hammer and Champy (1993) specify business processes as "*a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer. A business process has a goal and is affected by events occurring in the external world or in other processes*", while Taylor (1993) refers to the intangible aspects of processes and describes them as "*a set of specialized activities where coordination is achieved through communication*".

Two main streams of literature that aim at describing the inter-organizational and intra-organizational business operations, i.e., operational activities, processes and systems at various levels of analysis are:

(1) Business Process Management (BPM) includes various approaches to represent and model business processes (e.g., Aldin and Cesare, 2011; Duffy, 1994; Giaglis, 2001; Lee and Dale, 1998; Lin *et al.,* 2002; Recker and Rosemann, 2009; Van der Aalst *et al.,* 2000; 2003; Weske, 2007), to analyze and to improve business processes (e.g., O'Neill and Sohal, 1999; Yu and Wright, 1997; Lin *et al.,* 2002), to automate business processes (Kirchmer and Pantaleo, 2005; Watson and Holmes, 2000), as well as to scope, design and innovate business processes (e.g., O'Neill and Sohal, 1999). The approaches and techniques available in this area are designed to incorporate all activities relating to the transformation of knowledge about business systems into models that describe the processes performed by organizations (Scholz-Reiter and Stickel, 1996). The information one would want to gain from business process models is simply "*what is going to be done, who is going to do it, when and where will it be done, how and why will it be done, and who is dependent on its being done*" (Curtis *et al.,* 1992; p.77). Although the existing BPM techniques (or languages) fall into two categories - one based on graphical models and the other based on rule specification (Recker *et al.,* 2009; Lu and Sadiq, 2007; Phalp, 1998) - there is an enormous volume of publications on a variety of BPM techniques. Several authors have developed and discussed BPM and Enterprise Modeling techniques [15], the most dominant of which are Petri nets (Petri, 1962), Event-Driven Process Chains (EPC) or ARIS (Scheer, 1998), Unified Modeling Language (UML) (Fowler, 2004), Data Flow Diagram (DFD) (Gane and Sarson, 1979), Business Process Modeling Notation 2.0 (BPMN) (OMG, 2013a), IDEF3 (Mayer *et al.,* 1995), YAWL (Van der Aalst and ter Hofstede, 2005) and DEMO[16] (Dietz, 1999). Furthermore, the literature on BPM includes comparison of various BPM techniques and tools on interoperability, readability,

[15] Extensive overviews presenting hundreds of Business Process Modeling methodologies, techniques and tools are provided by Ami and Sommer (2007), Weske (2007), Ashuri *et al.* (2006), Aguilar-Savén (2004), Dommelen *et al.* (1999) and Kettinger (1997).

[16] Design and Engineering Methodology for Organization (DEMO), Available at: http://www.demo.nl

clarity, expressiveness, etc. (e.g., Green *et al.,* 2005; Keen and Lakos, 1996; List and Korherr, 2006; Lu and Sadiq, 2007; Recker *et al.,* 2009). Some BPM techniques are also used for Business Model design as well, for instance UML (Fowler, 2004), and IDEF0[17].

(2) Enterprise Architecture (EA) deals with the design and realization of an enterprise's organizational structure, business processes, information systems, and infrastructure (Lankhorst *et al.,* 2009; Bernus *et al.,* 2003; Chen *et al.,* 2008; Wolfenden and Welch, 2000). Janssen *et al.* (2005) advocate the link between Business Model and EA as "*in general, business models focus on the service value generated by a business, whereas EA models show how a business realizes these services. Linking these approaches results in a powerful modeling tool that couples the value exchange between businesses and the costs that are required to realize these services*"(p.2). Zachman (1997; p.5) describes architecture as "*a set of design artifact, or descriptive representation, that are relevant for describing as object such that it can be produced to requirements (quality) as well as maintained over the period of its useful life (change)".* The relationship between EA and operational processes, however, becomes more clear by a more recent definition provided by Ross *et al.* (2006; p.9) who define EA as, "*Enterprise architecture is the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company's operating model. The operating model is the desired state of business process integration and business process standardization for delivering goods and services to customers*". As a subset of EA, Business Architecture (BA) is as a subset of EA, which can be defined as "*A blueprint of the enterprise that provides a common understanding of the organization and is used to align strategic objectives and tactical demands*" (OMG, 2013b). In contrast to a bottom-up IT-focused view of EA, BA has a top-down business-oriented perspective (Versteeg and Bouwman, 2006). There are a few broadly accepted approaches in the EA community, including, Zachman framework (Zachman, 1987), the Open Group Architecture

[17] Integration Definition for Function Modeling (IDEF0), Available at: http://www.idef.com

Framework (TOGAF) (ISO, 2004; The Open Group, 2009), the Federal Enterprise Architecture (FEA) (Council, 1999), the Garner/Meta methodology, ArchiMate (Jonkers *et al.*, 2006; Lankhorst *et al.*, 2009; The Open Group, 2012), and the Dutch Government Reference Architecture[18] (NORA). Comparisons of several architectural approaches are, among other things, provided by Armour (1999), Schöenherr (2009) and Sessions (2007).

Note that a number of BPM and EA modeling approaches and ontologies are derived from or based on a conceptual foundation or meta-model, for instance ArchiMate (Jonkers *et al.*, 2004) and ARIS (Sheer, 1998) (see section 3.6 for a more detailed discussion).

Despite the large volume of literature on Business Model and Business Operations (including Business Processes and Enterprise/Business Architecture), the attention for the link between these two areas is relatively limited. Before digging into the conceptual gap between Business Model and business processes (section 3.6), the next section discusses what network enterprises are and why an in-depth understanding of the gap is even more crucial in networked enterprise settings.

3.5 Networked Enterprises & Complex Systems

No business is an island, instead they are involved in continuous exchange relationships within networks of identifiable organizational entities (Håkansson and Snehota, 1989). Recent studies show that, due to dynamic market, globalization, technological advancements (e.g., web 2.0), and ever-growing dispersed body of knowledge, a contemporary trend of networked firms is increasingly emerging (Bughin and Chui, 2010; Castells, 2011; Elg and Johansson, 2001; Thompson, 2008). Literature on organizational studies provide a variety of concepts to describe various forms of networked actors; e.g., networked enterprise (Chung *et al.*, 2004), virtual enterprise (Camarinha-Matos and Afsarmanesh, 1999), trans-sector enterprise (Baken *et*

[18] NORA: Dutch Government Reference Architecture (*in dutch: Nederlandse Overheid Referentie Architectuur*). Available at: http://www.noraonline.nl/

al., 2006), multi-side platforms (Gawer, 2009), open-innovation (Chesbrough, 2006), extended enterprises (Browne *et al.*, 1995), value networks (Allee, 2003), value constellation (Norman and Ramirez, 1993), business webs (Tapscott *et al.*, 2000), and alike. Without willing to become entangled in etymological or lexicological debate on similarities and differences between all these concepts, the Table 3.1, provides a few widely used definitions (a more detailed comparison of concepts and definitions is provided by Browne and Zhang [1999], Camarinha-Matos *et al.*, [2009] Martinez *et al.*, [2001], Park and Favrel [1999] and Santana Tapia [2006]).

Table 3.1 Concepts and definition on networked collaborative enterprises

Concepts	Definitions
Networked Enterprise	*"…we define a networked enterprise to be any coordinated undertaking that involves at least two autonomous parties that interact using information and communication technology (ICT)."*(Steen *et al.*, 2002; p.1-2)
	"A networked enterprise is a loosely coupled, self-organizing network of enterprises that combine their output to provide products and services offerings to the market. Partners in the networked enterprise may operate independently through market mechanisms or cooperatively through agreements and contracts."(Li *et al.*, 2010; p.128)
Virtual Enterprise	"*A Virtual Enterprise (VE) is a temporary alliance of enterprises that come together to share skills or core competencies and resources in order to better respond to business opportunities, and whose cooperation is supported by computer networks*." (Camarinha-Matos and Afsarmanesh, 1999; p.4)
	"*A VE is a coordination of legally independent enterprises, institutions or individuals which provide a service on the basis of a common understanding of business. The cooperation units mainly contribute their core competences and they act to externals as a single corporation. The corporation refuses an institutionalization e.g., by central offices; instead, the corporation is managed by using feasible information and communication technologies*." (Fischer *et al.*, 1996; p.2-3)
	"*Virtual Enterprises (VEs) are businesses providing services and products that rely on the resources of multiple enterprises. VEs can achieve their business objectives only through effective collaboration between the autonomous enterprises that comprise them."* (Georgakopoulos *et al.*, 1999; p.1)
	"*A VE is an aggregation of autonomous and independent enterprises connected through a network (possibly a public network like WWW) and brought together to deliver a product or service in response to a customer need*." (Rocha and Oliveira, 1999; p.1)

Extended Enterprise	*"Extended Enterprise is a conceptual business unit or system that consists of a purchasing company and suppliers who collaborate closely in such a way as to maximise the returns to each partner."* (Childe, 1998; p.322)
	"*Extended enterprise is the formation of closer co-ordination in the design, development, costing and co-ordination of the respective manufacturing schedules of co-operating independent manufacturing enterprises and related suppliers*." (Jagdev and Browne, 1998 ; p.217)
	"Extended enterprise represents a concept typically applied to an organization in which a dominant enterprise 'extends' its boundaries to all or some of its suppliers. An extended enterprise can be seen as a particular case of a virtual enterprise." (Camarinha-Matos *et al.,* 2009; p.5)
Value Network	"*A value network is a web of relationships that generates economic value and other benefits through complex dynamic exchanges between two or more individuals, groups or organizations. Any organization or group of organizations engaged in both tangible and intangible exchanges can be viewed as a value network, whether private industry, government or public sector*". (Allee, 2001; p.1)
	"A value-creating network is a series of dyadic and triadic relationships that have been designed to generate customer value and build sustainable competitive advantage to the creator and manager". (Campbell and Wilson, 1996; p.3)
	"A Dynamic network of actors working together to generate customer value and network value by means of a specific service offering, in which tangible and intangible value is exchanged between the actors involved". (De Reuver, 2009; p.12)
Collaborative Network	*"A collaborative network (CN) is a network consisting of a variety of entities (e.g. organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, thus jointly generating value, and whose interactions are supported by computer network."* (Camarinha-Matos *et al.,* 2009; p.4)

For the sake of consistency, the term networked enterprise will be used throughout this thesis, because it:

- includes both virtual and physical business (in contrast to virtual enterprises),
- underlines the sense of mutual collaboration between actors (in contrast to dominant network coordinator in extended enterprises),
- focuses on enterprise who not only create value (as in value networks) but also enable value creation,

- mainly focuses on providers (in contrast to the presence of other actors, like customers, in collaborative networks)

In an attempt to converge the essence of the presented definitions with the preceded discussion on Business Model and business processes, a networked enterprise can be defined as: *"hardly/non-substitutable linked companies that collaboratively aim at enabling or implementing the collective Business Model by means of offering service and product and/or sharing resources and capabilities."*

The definition delineates the outer edge of networked enterprises with Hawkins' (2002) classification:

- the first-tier stakeholders: providers with essential and non-substitutable tangible and intangible assets to the network and directly involved in determining the intended customer value and in creating the Business Model, and,
- the second-tier stakeholders: providers of goods and services required to the network, without playing a direct role in determining the intended customer value and in creating the Business Model.

The definition underlines a collaborative approach to realize a collective goal, i.e., the implementation of the Business Model to which all stakeholders are committed. The networked companies interact with each other by providing and sharing tangible and intangible values, in terms of services/products, resources and capabilities.

As discussed in the previous section, the interactions between networked enterprises are enabled and described by heterogeneous, often incompatible inter-organizational business processes of various stakeholders, which may also be geographically dispersed (Weske, 2007). As such, according to Akselsen *et al.* (1997) the areas of coordination and orchestration, control and collaboration, customer satisfaction, quality of service/product, relationships to partners and thrust, are some of the challenges that networked enterprise may need to deal with. Hence, it is reasonably safe to compare a networked-enterprise with complex systems. Without entering into the details of complex systems theory and several related theoretical

areas (including adaptive systems, agents, theory of chaos, emergence, systems, and alike), which are beyond the scope of this study, a brief discussion on complex systems helps identify dimensions along which networked enterprises may differ from each other (for a detailed discussion on complex systems see Caldarelli and Vespignani [2007] and Hooker [2011]). According to Rickles (2011; p.534), complex systems involve a triple of characteristics:

- A (unit) complex system must contain *many* subunits (the exact number is left vague)
- Theses subunits must be *interdependent* (at least *some* of the time).
- The interactions between the subunits must be non-linear (at least *some* of the time).

Using slightly different words, Amaral and Ottino (2004; p.1654) characterize complex systems as "*typically, a large number of components which may act according to rules that may change over time and that may not be well understood; the connectivity of the components may be quite plastic and roles may be fluid*". Amaral and Ottino (2004) underline the structure of the network of interactions between units comprising the system. The recent works on complex systems are in tune with the classification that is proposed by Weavers (1948), who refers to disorganized complexity and organized complexity. The former accounts complexity as a system (1) "*in which the number of variables is very large*" (p.539), and the latter (2) *"…in which each of the many variables has a behavior which is individually erratic, or perhaps totally unknown*" (p.539). Weavers (1948) illustrates the disorganized complexity with billiard balls: "*one can, but with a surprising increase in difficulty, analyze the motion of two or even of three balls on a billiard table…But, as soon as one tries to analyze the motion of ten or fifteen balls on the table at once, as in pool, the problem becomes unmanageable, not because there is any theoretical difficulty, but just because the actual labor of dealing in specific detail with so many variables turns out to be impracticable*" (p.538). The organized complexity, however, involves systems as "*organic wholes, with their parts in close interrelation*" (p.541). The complexity is caused by interactions between systems parts, leading to emergent behavior (or emergent property) that can appear when a number of simple entities (agents) operate in an environment, forming

more complex behavior as a collective (Korotayev *et al.,* 2006). In contrast to disorganized complexity, complexity is not subjected to the quantity of the interacting parts; instead interactions produce an effect different from or greater than the sum of their individual effects, i.e., synergy. According to Page (2011), the *diversity* of the interacting parts increases the generate complexity. To conclude, the reflection of complex system on networked enterprise implies that the complexity of the inter-organizational interaction (e.g., business processes) increases, among others factors, as the *number* and the *diversity* of the involved stakeholders increases, which, in turn, lead to an emergent outcome with unexpected properties and regularities (Caldarelli and Vespignani, 2007).

In the next chapter, the dimensions of complexity (i.e., network size and diversity) will be used for the purpose of case selection (see chapter 4, section 4.2.2). The next section continues the discussion on the gap between Business Model and Business Operations, and provides an overview of the exiting approaches, that potentially may be used to analyze the gap. In addition, the shortcomings of these approaches are discussed.

3.6 Business Model/Business Process Alignment

The central question of this research deals with the alignment between Business Model and Business Operations, and in particular, within networked business environments. Based on the discussion (including definitions) in the previous sections on the concepts of Business Model, Business Processes and Networked Enterprise, the notion of Business Model/Business Process Alignment can be defined as: "*the extent to which a Business Model supports/enables and is supported/enabled by the underlying operational activities, processes and systems of the Business Model executor(s), as a single or networked enterprises.*" In this section, several potentially useful approaches to analyzing and realizing alignment are evaluated.

3.6.1 The existing alignment approaches

With regard to the link between Business Model and operational business processes, two streams of Business Model literature can be considered,

focusing either on Business Model tooling or on Business Model conversion methods.

3.6.1.1 Business Model Tooling

Business Model tooling aims at analyzing Business Model in terms of its viability and feasibility, focusing on one or more operational aspects of Business Model implementation, including metrics to quantify and measure Business Model performance (Heikkilä *et al.*, 2010), analyzing the financial impact of activities on Business Model (Tian *et al.*, 2008; Johnson *et al.*, 2008), understanding the business/strategy operation model (Ross *et al.*, 2006), qualitative analysis of value exchange between stakeholders involved (Allee, 2008; Pijpers *et al.*, 2009), and linking high-level strategy to operational level activities (Porter, 1996). Table 3.2 (see the next page) provides a detailed description of each of these approaches, in what way these approaches aim to analyze the Business Model, the foci of analysis, unit of analysis, and how generic or specific these approaches actually are.

3.6.1.2 Business Model conversion approaches

Conversion methods, on the other hand, aim at translating or mapping a specific Business Model representation, such as Canvas (Osterwalder and Pigneur, 2002) or e^{3}value diagram (Gordijn and Akkermans, 2001), to a specific (business) process model, such as UML (Fowler 2004) and BPMN (OMG, 2011a). One of the first to discuss the importance of Business Model-business process alignment was Gordijn *et al.* (2000a), who explicitly stressed that separating Business Model from business processes would lead to poor business decision-making and inadequate business requirements. They proposed a model to distinguish the distribution of value (Business Model) from the way processes are actually performed: the so-called *e^3-value* ontology (Gordijn and Akkermans, 2001).

Table 3.2 Business Model Tooling

Tooling approaches	Tool description	Method	Foci of analysis	Unit of analysis	Unit of observation	Generic vs. Specific
CSOFT (Heikkilä *et al.*, 2010)	The CSOFT framework is a technique for Business Model estimation. It provides a process to transform Business Model draft into a systematic breakdown of the operational model which describes for each service its components, required IT and the key performance indicators. The framework claims to be useful in evaluation of robustness of Business Model by analyzing the "As-is" and "To-be" –states of resources and by identifying key performance indicators.	Qualitative and/or quantitative analysis based on key performance indicators resources (Business processes, Applications, Information, Hardware, Organization)	Performance	Business Model(s)	Service components	Generic
Business Model Canvas (2010)	The Business Model Canvas (Canvas) is based on the Business Model Ontology proposed by Osterwalder (2004). The Canvas is a template for developing new or documenting existing Business Models.	The Canvas represents a Business Model with a visual chart consisting of nine building blocks that describe value proposition, key partners, key activities, key resources, customer relationship, channels, customer segments, cost and revenue structure.	The nine building blocks	Single firm Business Model	Business Model	Generic

BEAM (Tian *et al.*, 2008)	The BEAM framework is for the modeling and analysis of Business Model designs involving a network of interconnected business entities. The framework claims to be useful to provide insight into value distribution among the entities and evaluation of Business Model performance under different scenarios.	Quantitative analysis based on financial performance indicators (e.g., customer price, marketing cost, revenue, sale volume), resources (tangible and intangible), and business roles, goals, decisions and entities, and resource consuming activities	- High-level roles and activities - Resource consumption and requirements - Revenue model - Decisions and interactions	(networked) Business Model	Value distribution among stakeholders	Generic
Operating Model (Ross *et al.*, 2006)	An operating model is the necessary level of business process integration and standardization for delivering goods and services to customers. An operating model describes how a company wants to thrive and grow.	Integrated with company enterprise architecture, one of the four operation models can be chosen (i.e., Diversification, Coordination, Replication, Unification), which is an actionable view, useful for strategy execution.	- Core business processes - Shared data driving core process - Key linking & automation technologies - Key customers	The firm strategy execution	Enterprise Architecture	Generic
The e^{3}alignment method (Pijpers *et al.*, 2009)	The e^{3}alignment aims exploring the inter-organizational alignment issues concerning the interaction between organizations, and their information systems, in a networked value constellation, seen from four perspectives, i.e., the business strategy, value creation, process, and Information Systems and Information Technologies (IS/IT).	Qualitative problem identification (from various perspectives) by using descriptive value diagrams and assessing possible solutions by employing impact analysis	- Strategy (strategic influences) - Value creation (exchange of value) - Process (value supporting activities) - IS/IT (technology to exchange information)	A service (or product)	Value interactions	Specific (following e^{3}value model – Gordijn & Akkermans, 2001)

Value Network Analysis (Allee, 2008)	Value network analysis (VNA) links specific interactions within the value creating network directly to financial and non-financial scorecards.	Descriptive representation of value creating network (value diagrams) based on qualitative analysis, in order to understand tangible and intangible values (and knowledge) exchange between stakeholders in order to identify inconsistency between tangible and intangible values	- Tangible value - Intangible value	Value network	Value network actors	Generic
Strategy Activity System (Porter, 1996)	Based on different strategy positioning different business activities need to be performed. The activity system aims at describing how higher-order strategic themes are identified or implemented through clusters of tightly linked activities.	Descriptive representation of Strategy level decisions (i.e., choices that need to considered to realize higher-order strategies) to analysis the link between overarching strategy and the underlying business activities	Strategic decisions, policies, and activities	Single firm business strategy	Firm strategies	Generic
Four elements Framework (Johnson *et al.*, 2008)	Similar to many (if not all) Business Model frameworks, this framework aims to describe the building blocks of a business. However, this framework includes rules, metrics and norms for the purpose of analysis.	Descriptive representation of Business Model based on value proposition, profit formula, key resources and processes, and quantitative analysis is recommended by using metrics.	Value creation Financial viability Resources Processes	Single firm Business Model	Business Model	Generic

The ontology has graphical representations of the following components: Actor, Value Object, Value Port, Value Interface, Value Exchange, Value Offering, Market Segment, Composite Actor and Value Activity (Gordijn *et al.,* 2000b). On a number of points, the e³-value ontology is similar to the Resource Event Agent[19] (REA) ontology (McCarthy, 1982; Geerts and McCarthy, 1999), such as *agents* (*actor* in e³-value) who provide or request *resources* (*value objects* in e³-value) by economic *events*, comparable to *value ports* in e³-value (Gordijn and Akkermans, 2003). The significant difference has to do with the *value activity* (i.e., a potentially profitable activity for one or more actors), which is included in e³-value ontology and completely lacking in REA (Gordijn and Akkermans, 2003). More recently, Pijpers and Gordijn (2007) have introduced the *e³ transition* model, the aim being to derive a process model from a value model by incorporating an incremental transition model. The approach starts by constructing an e³-value ontology and then defining the *ownership rights* and *possession rights* for each value object, after which a process model is created based on four steps: (1) create a swimming lane for each actor, (2) each value transfer is an exchange of an object between the same actors in the process model, (3) a value transfer and its related reciprocal value transfers have to be initiated by a participating actor, and (4) the order of processes has to be determined. Weigand *et al.* (2007) also propose a step-wise approach to derive a process model from e³-value ontology, taking three design aspects into account: resource management, communication and risk. Based on a set of steps, the value-model components are transformed into implementable processes, to be expressed in BPMN.

Two other approaches that are based on value model are *Activity Dependency Model* (ADM) and *Chaining Methodology*. The ADM, which was first proposed by Bergholtz *et al*. (2004) and later extended by Andersson *et al.* (2005), identifies, classifies and relates activities needed to execute and coordinate the transfer of value. The ADM represents four kinds of activities

[19] REA ontology can be traced back to business accounting, where there is a need to manage business through a technique called double-entry bookkeeping. The intuition behind the ontology is that every business transaction can be described as an event where two actors exchange resources (Andersson *et al.,* 2006a).

(value transfer, assignment, production and coordination) and four kinds of relationships (duality, flow, trust and trigger). Here, the e³-value ontology is used as input to construct ADM and different components of ADM are subsequently related to BPMN components (e.g., *coordination activity* gives a rise to a pool with sub-processes that are related to *value transfer activities*). With fewer details, Bergholtz *et al.* (2005) provide an integration methodology to derive e³value model from Business Model Canvas (Osterwalder, 2004). To do so, a set of integration steps has to be followed, including the construction of Business Model and value proposition, while special attention is also paid to value webs and risk mitigation, as important forces with regard to process design and management. The Chaining Methodology, on the other hand, extends e³value ontology by adding four value exchange components - a resource (e.g., a book), rights on resource (e.g., the ownership of a book), custody of resource (e.g., the delivery of a book to the buyer), and the evidence document (e.g., a ticket) - that help identify the actors and their relationships (Andersson *et al.*, 2006a). This forms the basis for the design of processes, which are described in terms of patterns stored in a pattern library (e.g., defined in UML Activity diagram and Class Diagram) and executed in different transaction phases defined by Open-EDI (ISO, 2004), i.e., planning and identification, negotiation, actualization and post-actualization. Edirisuriya and Johannesson (2008) extend ADM by adding value transfer analysis, which corresponds with the chaining methodology, i.e., an analysis of resources being transferred between actors, resource ownership and the documentary evidence related to the transfer. In their work, they only consider the negotiation and actualization phases of Open-EDI initiative.

Bergholtz *et al.* (2003) also recognize the distinction between Business Model and business processes and propose a unified framework to facilitate their analysis and integration in the final design. Their framework contains different process views for the incremental integration of Business Model (UMM[20]) with business processes (BPSS[21]), and a set of rules to govern the

[20] UN/CEFACT Modeling Methodology (UMM), Available at: http://www.ebxml.org
[21] Business Process Specification Schema (BPSS) ebXML Deliverables, Available at: http://www.ebxml.org

choreography of business collaborations. More extensively, Jayaweera (2004) elaborates on a unified framework and proposes a methodology called *BP*[3] (Business Process Pattern Perspective), the main purpose of which is to integrate different user views of the systems being developed by using UMM, ebXML[22] and BPMN (OMG, 2013a) modeling approaches. Also, based on the *agents* (or the actors), *economic resources* (the values as in e[3]value ontology) and *economic events* (or the value activities), business processes can be defined. In both approaches, the input needed for business process design is limited to the value-driven aspects, while, for example, information in its tangible and tacit form is not explicitly recognized. Moreover, the extent to which the models can be generalized is limited, since specific business process modeling approaches are applied. For instance, Hofreiter et al. (2007) propose a mapping from UMM business transactions to executable BPEL[23]. Although the focus is not on Business Model, similar principles are applied to map one onto the other. In this case, the logical flow of the process corresponds to the UML activity graph of business transactions. A business transaction describes the exchange of a business document and an optional response. Table 3.3 provides a summary of several conversion approaches. Next, the shortcomings of these approaches will be discussed.

[22] Electronic Business using eXtensible Markup Language (ebXML), Available at: http://www.ebxml.org

[23] Business Process Execution Language (BPES), Available at: http://www.oasis-open.org/standards#wsbpelv2.0

Table 3.3 Business Model conversion approaches

Authors	Aim	Method (steps)
Jayaweera (2004)	Business Model based on Resource-Event-Agent (REA) to BPMN	*BP³ method (Business Process Pattern Perspective) based on the Unified Framework (Bergholtz et al. 2003):* 1. Design the Business Model 2. Order the economic values defined in the previous step 3. Gathering information about existing negotiation dependencies 4. Establishing inter-phase and inter-pool dependencies 5. Applying a set of production rules on the results of the previous steps in order to generate a process model
Bergholtz *et al.* (2005)	Canvas to e³value to BPMN	1. Construction of Canvas 2. Partial derivation of a value web model (i.e., e³value) from the Canvas 3. Detailing the value web model into process model (i.e., BPMN)
Janssen *et al.* (2005)	e³value to ArchiMate	1. Link the revenue defined in the business part and analyzed in e3value, to the cost defined in the application and technology layers of ArchiMate 2. Use the business processes and supporting applications and technical infrastructure to determine the cost of the service offering
Andersson *et al.* (2005)	"Agent, Value transfer offering, Duality" Business Model to BPMN	1. Five steps to derive an Activity Dependency Model (AMD)* from Business Model 2. Nine steps to derive process model form the AMD 3. Adding procedural details for the sub-processes of the process model (e.g., by process patterns provided in UMM [2013])
Andersson *et al.* (2006a)	e³value to UML (activity diagram)	*Chaining methodology:* 1. Consider an e³value model 2. For each value exchange, determine whether the custody component of the value exchange exists and shall be modeled explicitly 3. For each value exchange, determine whether the evidence document component of the value exchange exist and shall be modeled explicitly 4. Identify a set of processes based on the extended e³value model from step 3 and the Open-EDI transaction phases (ISO 2010) 5. For each process, select a pattern (e.g., UMM [2013]) based on the resource managed by the process and the goals of the actors. Apply the selected pattern to the set of identified processes.

Pijpers and Gordijn (2007)	e³value to UML (activity diagram)	*E³transition approach:* 1. Adapt the actors, value activities and customer needs from the e³value model 2. Derive and determine the transfers of the actual object, ownership/possession right between providing/receiving actor from e³value model (and other additional information sources) 3. Each actor in the e³transition model becomes a *swim lane* in the process model 4. Every value transfer in the e³transition model is an exchange of an object between the same actors in the process model 5. Answers the question "Who initiates a value transfer and its corresponding reciprocal value transfer(s)?" 6. After it has been identified which exchanges and processes should occur in the process model the exchanges and processes have to be placed in the right order. The main question here is "What is the order of the processes?". Processes can either occur sequential or parallel.
Weigand *et al.* (2007)	e³value to BPMN	1. Three conceptual steps and one implementation step to construct Resource Management model from Value model 2. Three conceptual steps and one implementation step to construct Communication model from Value model 3. Determining the sequence flow based on logistics and risk analysis
Edirisuriya and Johannesson (2009)	e³value to BPMN	1. Six steps to derive an AMD from e³value 2. Nine steps to derive process model from the AMD
Fritscher and Pigneur (2011)	Canvas to ArchiMate (and IT services)	Using a correspondence scheme that links the seven elements of ArchiMate to the nine elements of the Canvas and IT services
Iacob *et al.* (2012)	Canvas to ArchiMate	1. Specifying the current company's primary operations and representing it by using ArchiMate (the baseline architecture) 2. Extracting the current Business Model from the baseline architecture and representing it by using Canvas 3. Specifying the target situation, adapting/extending the baseline architecture 4. Adapting/extending the earlier created Canvas based on the target architecture

* An AMD can be seen as a graph with four kinds of nodes, representing activities (i.e., value transfer, assignment, production, and coordination activities), and four kinds of directed edges, representing relationships between activities (i.e., duality, flow, trust, and trigger dependencies) (Andersson *et al.*, 2005).

3.6.2 Evaluation of the alignment approaches

Thus far, most of the existing tooling and conversion methods have been presented. However, these approaches have at least one of the three following shortcomings:

1) **Descriptive versus analytical**; by definition, the converting methods (Table 3.3) are not meant to support any analysis regarding Business Model viability and feasibility, but instead aim at (graphically) representing the Business Model in greater detail, by converting (sometimes called transforming or mapping) a Business Model into operational models (e.g., converting a Canvas model to BPMN or UML), or link Business Model to a process model or architecture, e.g., Canvas (Osterwalder and Pigneur, 2002) to ArchiMate (Lankhorst *et al.*, 2009). The architectural ontologies, such as ArchiMate or ARIS, suffer from a similar shortcoming. These models acknowledge the gap between Business Model and the business operations, without actually analyzing it or providing a theoretical focus to facilitate any analysis. As such, critical elements of networked enterprises, such as collective value creation, multilevel interactions and exchange of resources and capabilities, are could be described, but facility is provided to analyze these critical components of networked environments. Consequently, lack alignment with Business Model, the critical interdependencies, business/operations conflicts cannot be explicated and explored. Arguably, these models and ontologies were never meant to be used as analytical frameworks to analyze the conceptual gap, but rather to describe and manage processes at various levels of a single enterprise.

2) **Single-firm versus networked-view**; many conversion methods and some tooling approaches have a single-firm view, aiming at deriving one specific Business Model in relation to a specific process model (and vice versa), for example transforming the Business Model Canvas (Osterwalder and Pigneur, 2002) – which is a framework that focuses on the business logic of a single enterprise rather than on the dynamic interactions within a network of enterprises- into a single-firm business architecture with a focus on the intra-organizational interactions (Iacob

et al., 2012). A single-firm view is of very limited use in a networked-enterprise setting, where the complexity is inherent in the heterogeneous inter-organizational interactions, as is common in current networked economies.

3) **Single level-of-analysis versus multiple levels-of-analysis**; in particular, most Business Model tooling approaches do not pay attention to (or remain implicit with regard to) the operational interactions and processes within the networked stakeholders that are necessary to generate and provide resources and capabilities. These approaches focus primarily on the high-level (value) interactions between stakeholders, and not on the related information exchange and the required alignment of operational processes within and between organizational boundaries. For example, Allee's (2008) value network analysis does not address the operational processes and process dependencies between stakeholders, while Pijpers' *et al.* (2009) e^{3}alignment approach fails to extricate intangible operational assets, capabilities and dependencies, such as knowledge and expert systems, from high-order monetary values. Hence, a comprehensive approach is needed that identifies and includes the core building blocks of inter-organizational interactions, with the aim of obtaining a versatile view of the discrepancies between the high-level (i.e., business/strategic) and low-level (i.e. operational) stakeholder interactions. This limitation is recognized by Andersson *et al.* (2006), who has attempted to complement Resource Event Agent (REA) (Hurby, 2006), Canvas and e3value ontologies, by combining them into a 'reference ontology'. However, the resulting approach also focuses on value exchange, without paying explicit attention to the underlying business processes. Another example is the UMM approach (see subsection 3.6.1.2), which is a modeling methodology whose primary goal it is to capture the business requirements of inter-organizational Business processes. However, the methodology itself does not provide any insight into the resources to be exchanged.

To overcome these shortcomings, the next section proposes a framework that integrates and synthesizes various theoretical concepts, while explicitly addressing the multi-level inter-organizational business processes within networked-enterprise settings.

3.7 Theoretical Framework: Value, Information and Processes (VIP)

The previous section argues that the existing approaches, which may be potentially useful to understand and analyze the gap between Business Model and business operations bear, at least, three crucial shortcomings, in that they are *descriptive*, with a *single-firm view*, limited to *a single-level of analysis*. To overcome these shortcomings, in this section the attribute space of the framework is conceptualized. The theoretical foundation of the framework includes three layered levels of analysis, focusing on (1) value creation, exchange and interdependencies, (2) information creation, exchange, and interdependencies, and (3) the inter-organizational primary business processes. Next, the reason why these levels are chosen, the theoretical foundation and the constituting components of each level as well as the interrelations between levels, are discussed.

3.7.1 Value Exchange

Within a networked enterprise, multiple actors with diverse and often conflicting interests work together. The actors have different strategic objectives, rationale, definitions and interpretations of what and how they contribute to the generic service value proposition within the network. Nevertheless, the different contributions, or rather, exchanges of values, are arranged in a multilateral way, in which each actor gains tangible or intangible benefits from other actors.

With regard to the term 'value', countless definitions and interpretations have been proposed by many renowned scientists and writers. From Aristotle to Karl Marx, David Ricardo, Adam Smit, Carl Menger and others, many have discussed the meaning of value in an economic and philosophic sense. These classical debates are chiefly about the exchange value of

services or products within the context of trade theory. Relevant within the context of this study, is the definition provided by Porter (1985) who defines value as the amounts of money buyers are willing to pay for a service (or product). Note that the importance of intangible values and benefits are fairly implicit in the Porter's definition. From a marketing management view, Miller and Lewis (1991) relate value exchange to the stakeholder concept (Freeman, 1984) and suggest the exchange of value as a tool for analyzing and measuring all the stakeholder exchange relationships. Values however are not limited to tangible resources. According to the theory of resource-based view[1], resources can be divided into tangible tradable and non-specific to the firm, or intangible capabilities, which are firm-specific and are used to engage the resources within the firm (e.g., Amit and Schoemaker, 1993). In the literature on Business Model, Gordijn *et al.* (2000b) argue that the notion of value should be described in terms of benefits and revenues (see also Timmers, 1998). More recently, Bouwman *et al.* (2008) have emphasized the importance of the creation and exchange of value in the context of service engineering, referring to various types of value, including *intended value* (i.e., the value a provider intends to offer to customer or end-user of the service), *delivered value* (i.e., the value a provider actually delivers to customers or end-user of the service), *expected value* (i.e., the value a customer or end-user expects from service, and perceived value (i.e., the value a customer or end-user actually perceives when they consume or user the service) (Bouwman *et al.*, 2008; p.43).

Following the theories and discussions set out by Timmers (1998), Gordijn *et al.* (2000b), Osterwalder and Pigneur (2002) and Bouwman *et al.* (2008), the first layer focuses on value (V-layer). The question put forward by Gordijn *et al.* (2000a; p.41) "*what is offered by whom to whom and expect what in return?*" lies at the heart of this layer. The 'what' refers to tangible objects (e.g., money and goods) or intangible objects (e.g., services that are traded between actors). The analysis of value within networked enterprise, resonates also with the concepts of stakeholder analysis (Mason and Mitroff,

[1] The theory of resource-based view argues that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable, inimitable, and non-substitutable resources (e.g., Barney, 1991; Wernerfelt, 1984).

1981; Freeman, 1984) and requirements engineering (Sharp *et al.*, 1999), as both aim at identifying and describing the actors and their interaction, expectations, goals and relationships. In the context of Business Modeling, the *e³-value* approach is proposed to model a network of enterprises creating, disturbing and consuming economic values (Gordijn and Akkermans, 2001). The *i* modeling framework* is another approach, rooted in the requirement engineering discipline, which aims at determining what various actors want and how those wants will be achieved, in terms of goals, tasks, resources, and soft goals (Yu, 2011). The *use-case diagram*, as a part of UML (Fowler, 2004), aims at presenting a high-level graphical overview of the functionality provided by a system in terms of the actors, their goals (represented as use cases), and any dependencies between those use cases (Ambler, 2004). Finally, there are several *stakeholder analysis techniques*, which aim at identifying actors (i.e., stakeholders) and their interactions (Bryson, 2004).

Inspired by the e³value approach, the i* modeling framework, the Canvas model and the stakeholder analysis concept, the V-layer aims at analyzing the BM implementation within the network, in terms of Actors (or stakeholders), Value Objects, Value Proposition (or goals), Value Activities, and Value Dependencies (Table 3.4).

Table 3.4 The Value layer

Components	Description	Sources
Actors (or stakeholders)	An independent economic (and often legal) entity. By carrying out value activities, an actor makes a profit or increases it utility for its own benefit as well as for other actors in the networking, including, partners, providers, and customers.	Adapted from e³value model (Gordijn *et al.*, 2000a; p.43)
Value Objects	Tangible resources (e.g., goods, contract, money) and intangible capabilities (e.g., service, credit, authority), valuable to one or more actors within the network.	Adapted from e³value model (Gordijn *et al.*, 2000a; p.44)
Value Proposition(s) (or goals)	Values that an actor or a network of actors intend(s) to create, offer, capture and/or sustain.	Adapted from Business Model Canvas (Osterwalder, 2004; p.43) and Chesbrough and

		Rosenbloom (2002; p.533)
Value Activities	Actions or tasks an actor performs to create, provide and/or capture value for and from other actors within or outside the network.	Adapted from e^{3}value model (Gordijn *et al.*, 2000a; p.43) and Business Model Canvas (Osterwalder, 2004; p.84)
Value Dependencies	The need for a specific value object or activity.	Inspired by i* (Yu, 2011; p.45)

3.7.2 Information Exchange

The need to access resources creates multiple resource dependencies (Pfeffer and Salancik, 1987). Given the important role of information and communication technologies as enablers for new services, information and knowledge is an essential resource in the current trends of an economical, societal, and cultural decay, called the information age (Castells, 2011). Arguably, information resources can be seen as an instantiation of value resources discussed in the previous section (which also resonate with an extensive theoretical debate on the distinction between resources and capabilities in the resource-based view literature (e.g., Amit and Schoemaker, 1993; Makadok, 2001; Sirmon *et al.*, 2007). This study, however, promotes a separated analysis of data, information and knowledge creation and exchange, within and across stakeholders. Not only because information resources are pivotal to any (networked) enterprise, which deserve and require a dedicated attention, but also in order to reduce the inherent complexity of interactions of networked systems, and to understand the information dependencies between the collaborating organizations. Such a separation is strongly in line with the knowledge-based theory of firm, which argues that the resource-based perspective insufficiently recognizes the important knowledge (resources) have in gaining competitive edge, let alone distinguishing various types of knowledge-based capabilities (e.g., Alavi and Leidner, 2001; Grant, 1996). In a same vein, albeit from Business Model design perspective, Weill and Vitale (2001) disengage information from other resources in their Business Model Schematics. The Business Model Schematics is a pictorial

representation designed to highlight the Business Model's important elements, in which the flow of information is deliberately separated from other flows (e.g., money, products). Also Ballon (2007) emphasizes the access to key information about customers, products, markets, and costs, as an essential Business Model design parameter in networked environments. Versteeg and Bouwman's (2006) architectural approach echoes a similar view, distinguishing information as one of the pillars of business architecture, together with process and application view.

Several scholars from various fields, including information science, knowledge engineering, economics, organizational change and psychology, have studied the concept of information. For a better understanding, many scholars have broken down the concept into three categories: Data, Information and Knowledge (e.g., Ackoff, 1989; Alavi and Leidner, 2001; Bellinger *et al.*, 2004; Boisot and Canals, 2004; Howe, 2010; Liew, 2007; Rowley and Hartley, 2008; Zins, 2007). Although a detailed discussion of this widely accepted classification lies beyond the scope of this paper, it is noteworthy to address each category briefly. A classical definition of data, information and knowledge is provided by Ackoff (1989, p.5), who defines "*(1) data as symbols that represents a property of an object, an event or of their environment; (2) information as the answers to questions that begin with such words as who, what, when and how many*, and *(3) knowledge as the know-how that makes the transformation of information into instruction possible*". Within networked enterprises, all three categories, i.e., data, information and knowledge are generated, exploited and exchanged. In literature, the debate around 'intangible assets' appears under various synonyms, including intellectual capital, hidden value, and human capital (Bontis, 2001). Note that the prominence of information and data flow is not any different in the literature on supply chain management (Stevens, 1989).

The exchange of information in either form is an essential point of consideration in any Business Model. Weill and Vitale (2001) emphasize that Business Model viability actually depends on access to information (for instance data and information about partner resources and capabilities, customers behavior, the changes in market) and that the ability to identify, capture, share and exploit the key information determines and ensures the

Business Model viability and feasibility. For example, financial transaction is vitally important type of information. Owning and controlling transactions empower any company to control the customer, become a dominant actor of the network, and to claim a share of the revenues (Weill and Vitale, 2001). The concept of information exchange is considered to be highly critical in understanding the information supply and demand within networked settings (Castells, 2011). Casteleyn *et al.* (2009) sees the exchange of information as a finer decomposition of high-level value exchange that reveals the information dependencies and needs of networked actors. The notion of information and information exchange is a salient point in Information Systems literature as well. In the light of business architecture, Versteeg and Bouwman (2006) underline the relevance of information exchange as one of the main elements (the so-called 'areas of accountability') that provides a high-level architectural description of data and functions. Several modeling techniques, such as WebML+, include the notion of information flows as a part of business processes (Tongrungrojana and Lowe, 2003). The UMM modeling approach is yet another example that includes information exchange and inter-organizational business processes in a technology-neutral and implementation-independent manner. Similarly, the Data Flow Diagram (DFD) approach (De Marco, 1979; Gane and Sarson, 1979) focuses on the flow of data through an information system and the system's interactions with the outside world (Ambler, 2004).

In line with the concepts and theories discussed so far, the I-layer consists of Information Access (or authorization), Data/Information/Knowledge Objects, Information Flow and Information Dependencies (Table 3.5).

Table 3.5 The Information layer

Information	Descriptions	Sources
Information Access (or authorization)	Control, authorization or ownership of data, information, and/or knowledge.	Adapted from Weill and Vitale (2001)
Information, Data, Knowledge Objects	**Data.** Numbers, characters, images, or other method or recording, in a form that can be assessed by a human or (especially) input into a computer, stored and processed there, or transmitted on some digital channel. Data on its own has no meaning, only when interpreted by some kind of data processing system does it take on meaning and become information. An example is a database of automatically stored users' behavior. **Information.** The result of applying data processing to data, giving it context and meaning. Some examples are contracts, product specifications, or interpreted data of users' behavior. **Knowledge.** The appropriate collection of information, such that it's intent is to be useful. Knowledge differs from data or information in that new knowledge may be created from existing knowledge using logical inference. If information is data plus meaning, then knowledge is information plus processing. Examples are experts' tacit knowledge and expert information systems.	Adapted from Ackoff (1989), Alavi and Leidner (2001) Bellinger (2004), Howe (2010)
Information Flow	The way data, information and knowledge are created, accessed, shared or traded within and between networked actors.	Adapted from Data Flow Modeling (DFD) De Marco (1979)
Information Dependencies	The need to access or possess a specific data, information and/or knowledge object.	Inspired by Pfeffer and Salancik (1987), and i* (Yu, 2011; p.45)

3.7.3 Business Processes

Businesses are characterized by an almost infinite number of processes of all kinds that belongs to different units of organization. Business processes represent a wide range of companies' activities (i.e., intra-organizational processes). In addition, business processes are the linking pins between

providers, suppliers, customers, etc. (i.e., the inter-organizational processes). As proposed by Porter (1985), the business processes may be a linear chain of activities, forming a straight line of input/output, or a dynamic, iterative and nonlinear relationships and interactions between networked actors (Melão and Pidd, 2000; Lindsay *et al.,* 2003). Porter (1985) classifies the company's activities into *primary* processes (i.e., activities that are involved in the physical creation of the product or service, e.g., in/outbound logistics, operations, marketing and sales, delivery, after sale servicing), and *support* processes (i.e., activities that are involved in providing the inputs and infrastructure that allow primary activities to take place, e.g., procurement, human resources, technology development and firm infrastructure). It is not trivial to distinct the Porterian physical/operations product-driven context from service industry. From a service innovation and engineering perspective, Grönroos (1990) underline four characteristics that discriminate a service from product, i.e., *intangibility* (they cannot be seen of tasted) *inseparability* (they are produced and consumed at the same time), *heterogeneity* (they are unique and hard to standardize or exactly repeated), *perishability* (they cannot be stored, transferred or resold). Notwithstanding the mentioned differences, also services are comprised of business processes (Grönroos, 2007).

Several business process classifications are proposed, most of which are based on Porter's approach (Melão and Pidd, 2000). For instance, Mooney *et al.* (1996) refer to operational and management processes in their process typology. The former includes production processes, design and development processes, product and service delivery processes, and the latter includes coordination, control, knowledge or communication processes. A more detailed classification is proposed by Curtis *et al.* (1992) who distinguish four distinct perspectives: (1) 'functional', which represents which process elements and the related informational entities (e.g., data, artifact, product) are being performed, (2) 'behavioral', which represents when certain process elements are performed (e.g., sequencing, feedback loops, iterations, conditions, entry and exit criteria), (3) 'organizational', which represents where and by whom (which agents) in the organization process elements are performed, and (4) 'informational', which represents

the informational entities produced or manipulated by a process. While the latter two perspectives are incorporated in the value and information layers discussed earlier, the former two perspectives are the main focus of the business process layer, discussed in this section. Accordingly, this section underlines -besides the value and information objects, activities and dependencies- the need to understand and evaluate business processes within and between the networked actors.

Inspired by the discussed process modeling techniques (e.g., BPMN, ARIS, ArchiMate), as well as the presented business process classifications, the P-layer consists of the identification of the Primary Business Processes, Business Process Behaviors, Business Process Unit (or boundaries), and Business Process Dependencies (Table 3.6). Given that the focus of this study is on the operational processes behind Business Model, the *primary* business processes are the unit of analysis, and the *support* business processes are of less interest.

Table 3.6 The Process layer

Components	Descriptions	Sources
Primary Business Processes	Primary activities that is required to enable the physical or virtual creation of the product or service, within or across the borders of the company (e.g., in/outbound logistics, operations, marketing and sales, delivery, after sale servicing).	Adapted from Porter (1985), Mooney *et al.*, (1996), Grönroos (1990)
Business Process Behaviors	The sequence, flow, iteration or condition of a process.	Adapted from BPM approaches including BPMN and UML
Business Process Units (or boundaries)	A set of processes that are belonging to a particular system, task, team, company or network.	Adapted from BPM approaches including BPMN and UML, ArchiMate (Lankhorst *et al.*, 2009); Business Architecture (Versteeg and Bouwman, 2006)
Business Process Dependencies	The need of a process to be enabled/triggered by or integrated with another process.	Inspired by i* (Yu, 2011; p.45)

Thus far, the three generic levels of the alignment framework are conceptualized. The three levels are included in a layered framework (Figure 3.2). Additionally, figure 3.2 illustrates the dynamics and interrelationship between and within the layered levels (i.e., the arrowed vertical and horizontal axes). Note that the value level incorporates mainly aspects from the Business Model literature, while the lower level information and process layers mainly include the process and information modeling aspects. As the figure 3.2 indicates, (1) by identifying the core (networked) stakeholders, their authorization and their organizational or process boundaries, the structure of the business network can be described, (2) by identifying the value propositions, value and information objects, and the primary business processes of the stakeholders involved, the company or networked enterprise resources and capabilities (with regard to the intended collective Business Model) can be described and analyzed, (3) by identifying the value activities, information flow, and business process behavior within and between stakeholders, the core relations and interactions can be described and analyzed, and (4) the identification of value, information and business process dependencies enable to analyze the stakeholder interdependencies and responsibilities they need to assume to implement the Business Model. Such an analysis leads to an in-depth understanding of Business Model operational feasibility, which, in turn, helps reveal operational obstacles, complexities, conflicts and limitations. Overall, it can be argued that the proposed multilevel analysis, including the corresponding components and the dynamic vertical and horizontal interrelationships and interactions between components, help bringing the two areas of Business Model and operations closer together. The next section describes how the proposed framework can be used.

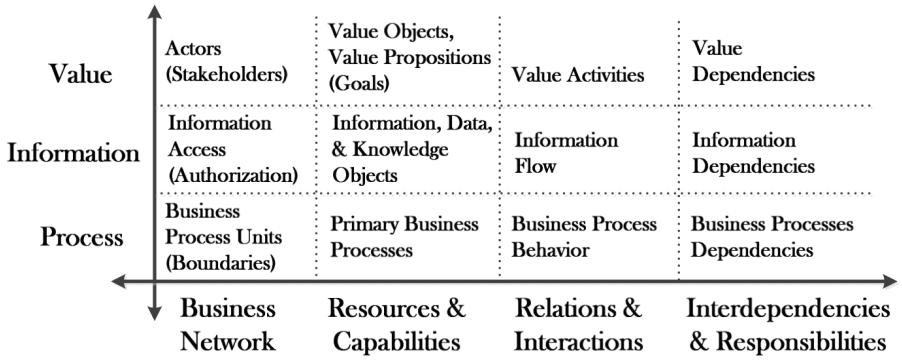


Figure 3.2 The VIP framework

3.8 Discussion and Conclusion

This chapter described a conceptual gap between Business Model and business operations, within networked-enterprise environments. To understand the gap, several underlying theories and concepts with regard to Business Model, processes and architecture, were elaborated in this chapter. The chapter continued the exploration of several underpinning streams of literature, including Business Modeling, Business Process Modeling, Business and Enterprise Architecture, Stakeholder Analysis and Knowledge-based theory of firm. From a theoretical viewpoint, it was argued that the existing body of knowledge fall short of providing an approach that aims at (1) analyzing (instead of describing) the gap, in a (2) network-driven (instead of single-firm driven) fashion, considering (3) multiple levels of business operations (instead of merely focusing on for instance value-oriented processes). By combining several concepts, the chapter proposes a model that intends to overcome the identified shortcomings. The proposed model, i.e., the VIP framework, decomposes a networked enterprise into a set of generic components, including networked stakeholders, value and information objects and activities between them, intra/inter-organizational business processes, and various forms of stakeholders' interdependencies (see figure 3.2).

Although the framework is still in a conceptual stage, it can be applied in both a descriptive and an analytical way (Figure 3.3). That said, generally

speaking, a framework is not descriptive or analytical in itself, but the use of the framework determines its essence and utility. A framework, however, may embed a mechanism to facilitate the process of describing and analysis. Accordingly, the structure and composition of VIP framework aims to allow a systematic collection and aggregation of vital facts about the link between Business Model and business operations. On the other hand, the analytical application enables a systematic evaluation of the operational arrangement of the networked-enterprise, for instance, by identifying stakeholder interdependencies and interactions or the dynamic between and within value, information and process layers. The output of the evaluation serves as directives to reconfigure Business Model or the underlying processes, evolving the Business Model towards an operationally feasible design. As such, the (potential) operational conflicting, critical or complex processes can be identified and a relatively accurate estimation of Business Model feasibility can be obtained.

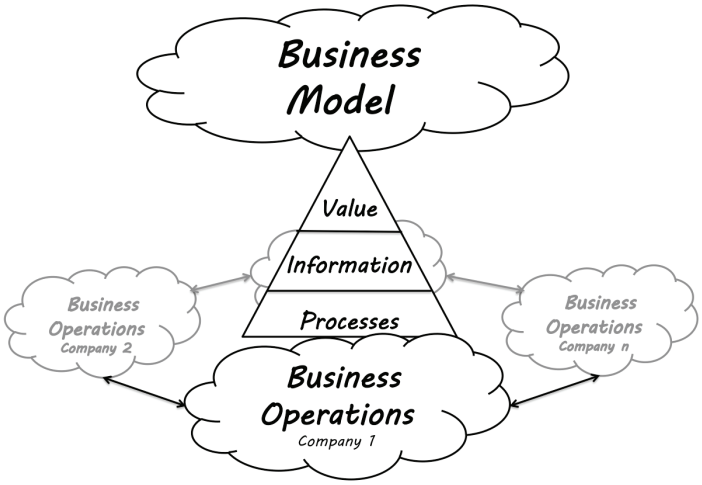


Figure 3.3 The VIP framework within networked-enterprise

Chapter five discusses how the VIP framework is evaluated by four case studies. As depicted in figure 3.3, the case studies are subjected to an analysis enabled and structured by the VIP framework, in order (1) to describe value and information exchange within and across networked

stakeholders as well as processes and systems shared between them, and (2) to deploy the descriptive insight to further explore and analyze stakeholder interdependencies, relationships, conflicts, and complexities. Before digging into the empirical study, the next chapter discusses the research method, how cases are selected, and how a comprehensive set of data are collected and analyzed.

Chapter 4. Research Approach

> *"[I]f I had only one hour to save the world, I would spend fifty-five minutes defining the problem, and only five minutes finding the solution."*
>
> Attributed to Albert Einstein (Couger, 1994; p.178)

In the first chapter (section 1.4), it was argued that a case study is the most appropriate research method to explore the conceptual gap between Business Model and Business Operations. This chapter elaborates on the same argument *why* case study research approach is applied and explains *how* exactly the case studies were conducted.

4.1 Case study

With regard to the focus of this study, a few empirical studies are available on the alignment of Business Model and business operations within networked-enterprise. Hence, it is not clear what factors need to be considered, and how/why they affect alignment. Guided by the framework proposed in the previous chapter, this study aims at collecting and analyzing empirical evidence, based on the thoughts, opinions and experiences of stakeholders, as well as other written data sources, focusing on a specific research domain, i.e., networked cases in the Smart Living sector. In accordance with the research objective, case study is proposed to be suitable *"to understand the nature and complexity of the processes taking place"* (Benbasat *et al.,* 1987, p. 370). Many definitions have been proposed for case study research (Benbasat *et al.,* 1987; Bonoma, 1985; Kaplan, 1986; Stake, 1995; Yin, 1994). However, the most frequently cited and broadly accepted definition is provided by Yin (1994, p.18), who defines a case study as "*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident".* It is emphasized that case study aims to

explore predefined phenomena, but does not involve explicit control or manipulation of variables; the focus is on gaining an in-depth understanding of a phenomenon and its context (Cavaye, 1996; Lee, 1989). In addition, case study ought to be useful to build theory in new topic areas (Dooley, 2002). According to Eisenhardt (1989; p.548) "*…there are times when little is known about a phenomenon, current perspectives seem inadequate because they have little empirical substantiation, or they conflict with each other or common sense*." As it is argued in the previous chapter, the existing literature lacks in providing useful theories and approaches to address Business Model/Business Operations gap within networked environments. According to Eisenhardt (1989) case study research is independent from prior literature or past empirical observation. She argues that "*case study research is particularly well-suited to new research areas or research areas for which existing theory seems inadequate. This type of work is highly complementary to incremental theory building from normal science research. The former is useful in early stages of research on a topic or when a fresh perspective is needed, while the latter is useful in later stages of knowledge*" (p.548). In addition, quantitative methods can be used to validate the resulting theories of this study (Boudreau *et al.*, 2001; Eisenhardt, 1989). However, based on the main research question, the study is designed to explore and evaluate of the problem at hand (i.e., Business Model/Business Operations gap), instead of quantitative validation of the results (for more details about research limitations, see chapter seven, section 5.5).

Awareness about case study weaknesses helps researchers anticipate possible problems during research. Flyvbjerg (2006) identified and summarized a set of these weaknesses in five conventional misunderstandings about case study research: (1) theoretical knowledge is more valuable than concrete practical knowledge, (2) one cannot generalize on the basis of an individual case, (3) the case study is most useful for generating hypotheses, instead of testing and theory building, (4) the case study contains a bias toward verification, and (5) it is often difficult to summarize and develop general propositions and theories on the basis of specific case studies. In short, complexity (i.e., lack of simplicity and parsimony) and external validity are potential problems in case studies

(Eisenhardt, 1989). Flyvbjerg (2006), however, explains how each of these issues, if not directly wrong, is oversimplified. Discussing each of these misunderstandings lies beyond the scope of this thesis. However, it is worthwhile to mention that a rigorous and well-structured case study design safeguards the reliability, validity and parsimony of research (Eisenhards, 1989; Yin, 2009; Flyvjerg, 2006). That said, a case study protocol is suggested to be a significantly useful mechanism to systematize case study design and analysis (Yin, 2009).

4.2 Case study protocol

Yin (2009) proposes the case study protocol as a major component in asserting the reliability of the case study research. The protocol guides the researcher to collect data in a systematic way, especially in a multiple-case study. In addition, it keeps the researcher focused on the core issues within the cases, and forces him/her to anticipate several problems that he/she may encounter during the case study, including the way that the case study reports are to be completed (Yin 2009). According to Yin (2009), such a protocol includes the purpose of the study (section 4.2.1), study selection (section 4.2.2), data collection (section 4.2.3), and case study analysis (section 4.2.4). Sections 4.3 and 4.4 discuss the case study preparation and the findings of this preparatory pilot study.

4.2.1 Case study purpose

The purpose of case study is to gain an in-depth understanding of the cases status quo (on alignment between Business Model and operational processes), which, in turn, helps explore and evaluate the framework developed in the previous chapter. As discussed in chapter one, conducting a case study enabled us to explore whether and how networked stakeholders deal with VIP building blocks (i.e., value and information exchange, and the business processes), and whether the proposed framework helps us identify (potential) obstacles at various levels of analysis (i.e., business and operations), particularly within networked-enterprises. Multiple data sources are used to improve internal validity, i.e., websites, reports, contracts (more details are provided in section 4.3.3). However, the stakeholders' opinions and experiences (from both a business

and operations perspectives were the key data source to reveal latent issues undermining the Business Model operational feasibility. The next section discusses the criteria based on which cases are selected.

4.2.2 Case study selection

To assure a certain extent of external validity, a multiple-case design is adopted (Herriott and Firestone, 1993; Miles and Huberman 1994; Yin, 2009). Through replication of cases, the phenomena under study can be explored in-depth and the findings can be compared (Yin, 2009). However, to create a feasible and manageable case variety, the research was limited to four cases. The first two criteria that were considered as the basis of case selection were conform the research question posed in chapter one (section 1.3),

1) All cases should have a networked-enterprise structure and,
2) All cases should be rooted in the Smart Living domain.

The third criterion is that the cases should be related to healthcare services. Readily available access to several e-health cases (including relevant actors, data and documentations) was the main reason to focus on this specific branch of the Smart Living. At the same time, by having various cases from a same sector, to a certain extent the analogy between cases could be preserved, which, in turn, enabled us to conduct a cross-case comparison at the end (i.e., reducing the fallacy of false analogy). So, a case was included if the case owners aimed at profiling and positioning themselves as the Smart Living service provider (see the definition in chapter 2, section 2.1), and at providing healthcare related service or product. The third criteria, however, represented the case replication strategy, which was based on theoretical sampling (Yin, 2009; Eisenhardt, 1989). To assure a certain extent of external validity, a multiple-case design was adopted (Herriott and Firestone, 1993; Miles and Huberman, 1994; Yin, 2009). To create a feasible and manageable variety of cases, four cases were examined. As argued in previous chapter (section 3.5), the selection of the four cases is based on the two dimensions of the complex system theory, i.e., network size (number of tier-one stakeholders involved) and stakeholders diversity (number of unique roles within the network). Figure 4.1 represents the four case studies, along the two dimensions of system complexity.

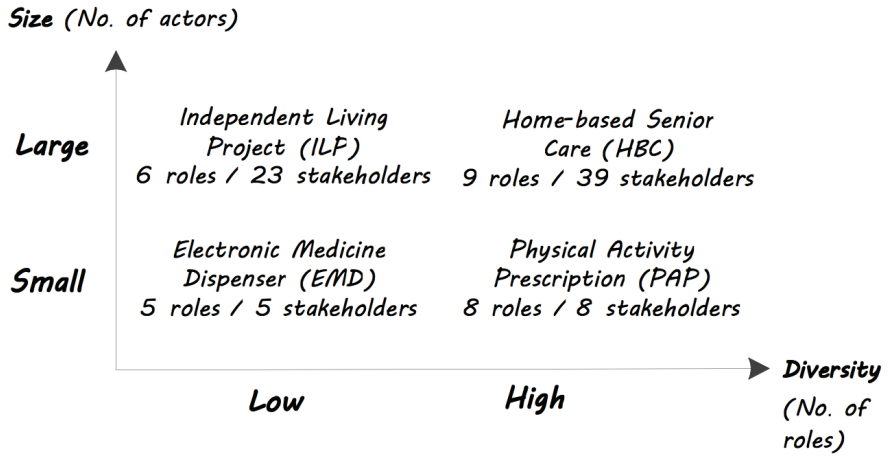


Figure 4.1 The case study sampling based on two dimensions of complex systems

4.2.3 Data collection

Describing the gap between Business Model and Business Operations and revealing alignment obstacles at various levels of analysis in-between, calls for an inductive, qualitative, explorative research approach. As such, a primarily semi-structured interview method was used, as a way to scrutinize stakeholders' thoughts, experiences and opinions about the gap within the context of networked projects they were involved. Yin (1994, p. 18) argues that "*case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis*". Concerned with internal validity, the interview data were combined and complemented with various data sources (data triangulation, see Yin 1994), including company sales presentations, websites, and contracts. Additionally, during the interviews several memos were made regarding meta-information, including the interviewees' emphasis, reactions and expressions, and key concepts discussed, with the corresponding time indications. Immediately after each interview, a short report was written about the essential topics that were discussed during the interview. In accordance with the nature of study (i.e., focusing on the link between business and operations) the unit of analysis is not an individual firm, but a networked enterprise, consisting of

several interdependent partners that together aim to achieve a common goal, while the unit of observation includes staff members at both strategic and operational levels (i.e., *theoretical selection*, Kuzel, 1992; Patton, 1990). In additions, interviews were conducted with informants that were recommended by the key informants in each case (i.e., *reputational selection*, Goetz and LeCompte, 1984), with informant who might have a different view from other stakeholders (i.e., *maximum variation*, Guba and Lincoln, 1989). Table 4.1 presents a list of interviewees and the additional sources that are used per case.

Table 4.1 The interviewees on the both strategic and operational levels and the additional data sources

Case 1. Physical Activity Prescription

[Conducted between October 2012 and February 2013, Turku, Finland]

	Title/Role	Acronym	Company	No. of interviews
Strategic	The Project Initiator	PI	Pharmacy Training Company	1
	Service Development Directors	SD	Occupational Healthcare provider	2
	Project Manager	PM	Finnish Sports Pharmacy	4
	ICT Developer Manager	IDM	Occupational Healthcare provider	1
Operational	Pharmacist	PH	Pharmacy	1
	Operational Manager	OM	Finnish Sports Pharmacy	1
	Project Manager	PM	Finnish Sports Pharmacy	*The same project manager as at the strategic level*
	Sales and Marketing	SMP	Pharmacy	1

Additional data sources: companies websites, documents regarding stakeholder analysis, business and market analysis reports, a draft version of canvas Business Model

[Case 2. The Electronic Medicine Dispenser]

[Conducted between February 2013 and May 2013, The Hague, The Netherlands]

	Title/Role	Acronym	Company	No. of interviews
Strategic	Director	DR	Healthcare provider	3
	Commercial Director	CD	Business integrator	1
	Regional Manager	RM	Healthcare provider	2

Operational	Commercial Advisor	CA	Business integrator	2
	Operational Manager	OM	Healthcare provider	2
	Emergency Center Staff	ES	Healthcare provider	1
	Operational Manager	PH	Pharmacy	1

Additional data sources: companies websites, device guidelines, governmental regulations on care at home, evaluation report of a pilot study conducted by another healthcare provider, device marketing presentation, contracts, and pricelists

[Case 3. Independent Living Project]

[Conducted between December 2011 and March 2012, Helsinki, Finland]

	Title/Role	Acronym	Company	No. of interviews
Strategic	The Project Initiator	PI	University (professor and entrepreneur)	1
	Director	DIR	Platform provider	1
	Chief Executive Officer	CEO	Data integrator	1
	Project Manager	PM	Platform provider	4
Operational	Development Manager	DM	University	1
	Enterprise Architect	EA	University	3
	Operational Manager	OM	University	1

Additional data sources: companies websites, marketing presentations, meeting minutes, service/product guiding documents, demonstration lab, and device guiding documents

[Case 4. The Home-based Senior Care]

[Conducted between September and December 2011, Wuhan, China]

	Title/Role	Acronym	Company	No. of interviews
Strategic	Chief Executive Officer	CEO	Platform provider	2
	Project Manager	PM1	(Chinese) business intermediary	4
	Director	DIR	Smarthome-lab	1
	Project Manager	PM2	(Finnish) business intermediary	1
Operational	Process Manager	PRM	Smarthome-lab	2
	Development Manager	DM1	University	1
	Development Manager	DM2	University	1
	Developer	DVL	University	1

Additional data sources: companies websites, marketing presentations, meeting minutes, formal contracts, service/product guiding documents, demonstration lab, the business integrator terms of condition document, and Service Level Agreements (SLAs)

On average, each interview took about two and half hours and all the interviews were recorded. The search for new interviews and other data sources only stopped after saturation had been reached (Glaser and Strauss, 1967), i.e., the last interviewees could not provide any new insight (or new documents that might lead to new insight).

4.2.4 Case study method and analysis

The case study data is used for two main purposes:

Descriptive stage:

As discussed more extensively in the previous chapter (sections 4.2), the descriptive part of the study is performed through iterative interviews with one or two key informants who helped construct, review, and adjust the Business Models and the VIP diagrams. After a brief introduction, the interviewees were asked to describe the overarching Business Model from their point of view. The commonly accepted components of Business Model, included in STOF and Canvas, including the projects value propositions, underlying technologies, stakeholders and their relationships, key resources and cost/revenue structure, were addressed in the first part the interview. In an iterative way, together with the key informants, the Business Model of each case could be developed, reviewed, and finalized. Through follow-up interviews with staff member at different organization level (i.e., strategy, business and operations), more suggestions about Business Model adjustments and refinements could be collected.

Next, with questions drawn from the VIP framework, the interviewer steered the interviews in order to gain an in-depth understanding of the issues related to the implementation of Business Model. The questions focused on (1) the underlying structure of value and information and how they are created and exchanged and (2) the structure and flow of primary business processes that are shared between the (first-tier) stakeholders, and (3) as well as how their operational activities, processes, systems or infrastructure are established or will be designed. As mentioned in the chapter three, the focus is on the primary business processes, activities and systems that are needed to enable the (network) Business Model (and not the supportive processes). These additional questions advanced the Business

Model with detailed insight into the inter-organizational operational processes that was needed to implement the Business Model. The operational processes were visualized by VIP diagram, which is a graphical representation of the VIP components and relationships between them. Similar to Business Model design, the VIP diagram were developed in the first interviews with the key informants, and reviewed iteratively throughout the subsequent interviews.

Analytical stage:

What and how operational issues (with regard to value and information exchange and inter-organizational business process) (may) undermine the Business Model was the question that triggered the analytical part of case study. The analytical part, however, requires a different approach. Here, the aim was to reveal, analyze and explain sources of misalignment at and between the VIP levels.

For the most part, our data analysis follows the methods and suggestions of Miles and Huberman (1994) and Strauss and Corbin (1998). First, for each case, all the written data sources were indexed. To prevent data overload (Miles and Huberman, 1994, p.56), we condensed the recorded interview data by making a long-list of transcribed quotes. However, to prevent data loss, any sentence that refers or clarifies Business Model components and/or the operational VIP interactions as well as alignment complexities, including vulnerabilities, conflicts, critical issues, and dependencies between stakeholders, were added to the quotes database. Then, the collected data quotes and other written data were subjected to open-coding. Open-coding is the part of the analysis concerned with identifying, labeling, categorizing and describing phenomena found in the text (Strauss and Corbin, 1998, p.223). The quotes were coded either descriptively (i.e., attributing sources of alignment/misalignment to a segment of text) or interpretatively (i.e., attributing meaning to a segments of text) (Miles and Huberman, 1994, p.57). The process of open-coding was initiated with a provisional "start list" of codes (i.e., master code), which aim at explaining or indicating an actual or potential source of misalignment between Business Model and different levels of operational processes (such as value conflicts, value-information conflicts, value-process conflicts, information-process conflicts)

(Miles and Huberman, 1994, p.58). Next, in an inductive way, all the quotes were reviewed, which led to more codes and the identification of more alignment issues at different levels.

Through the process of open-coding a large number of codes was induced, which was reduced by axial-coding. Strauss and Corbin (1998, p.229) define axial-coding as "*a set of procedures whereby data are put back together in new ways after open coding, by making connections between categories*". At this stage, in particular, the relationship, interactions and influences between and within value, information and process levels were analyzed.

At the final stage, the author aimed at grouping summarized segments of data into a smaller number of sets, themes, or constructs, the so-called *pattern-coding* (Miles and Huberman, 1994, p.69). Strauss and Corbin (1998, p.236) propose a similar approach, called selective coding, which is the process of integration of concepts around a core category and the filling in of categories in need of further development and refinement. At this stage, the codes and their relationships are scrutinized into a concise cluster of factors that explain or reveal the business/operational discrepancies (at a value, information and process level) and the underlying causes. The factors were higher order explanations of *why* and *how* business/operational alignment problems are occurring. To ensure that no valuable information eluded the author's attention (and hence would increase internal validity), co-researchers reviewed the codes and the identified relationships, patterns and factors. For each case, the earlier revealed factors were (re-)evaluated and when needed, adjusted based on new findings. This process yielded six factors, which are discussed in section 6.2.

Case study analysis

In line with these two levels (i.e., descriptive and analytical), the case studies contain three components:

1) *Identifying and describing the Business Model based on STOF or Canvas framework,*

In the first step, we steered the interviews (and search of other data sources), mainly to understand the high-level overarching Business Model behind the

intended services (or products). However, as each Business Model framework has its peculiar properties, using only one framework to describe all cases may lead to a biased effect, in which case the case study results are to be attributed to the use of that specific Business Model framework. To reduce bias and improve the generalizability of the case study findings, two distinctive, albeit generic, Business Model frameworks that are well-accepted in Business Model community, are applied. Two of the four cases are described by using Canvas framework and the other two cases by using STOF framework.

Considering the abstract level of Business Model frameworks, a significant part of information, required for business modeling purposes, was extracted from the available (written) data resources, such as company websites and formal contracts. In addition, through iterative interviews, especially with the key informants (i.e., case members who were most intensively involved and responsible at both business/strategic and operational level), the constituting components of STOF and Canvas framework were discussed and defined.

2) *Describing the operational processes at three VIP levels, necessary to enable/implement the Business Model developed in the previous step,*

With questions in line with the VIP framework, we steered the interviews in such a way that an in-depth understanding about Business Model implementation could be gained. The main foci of interviews were (1) the underlying structure of value and information and how they are created and exchanged, and the inherent interdependencies between stakeholders, (2) the structure and flow of primary business processes that are shared between stakeholders and the inherent process dependencies between stakeholders. The additional questions in this step advanced the Business Model (from previous step) with vital inter-organizational operational processes, interactions and interdependencies, which are visualized in descriptive VIP diagrams. The VIP diagrams were drawn or printed on A3 paper format, to facilitate interviews with the key informants. In some cases, more than one interviewee participated in these sessions. During the interviews, the informants could point out various parts of the VIP

diagrams, and discuss, extend or adjust the diagrams. The review process continued throughout the succeeding interviews with other members involved in the cases.

3) *Identifying the alignment issues at and between the three VIP levels.*

The output of the first two steps gave a comprehensive description of cases high-level Business Model, and the operational structure on which the Business Model will be implemented. In the third step, interviews proceeded with additional questions about interactions at and between three VIP levels. Also in this step, several recursive discussion sessions were organized (again, facilitated by the finalized VIP diagrams on A3 paper format), to scrutinize the VIP interactions and interdependencies, and to pinpoint interactions and processes that cause (or may cause) misalignment between Business Model and operational processes, which, in turn, may jeopardize the implementation of the Business Model.

4) *Evaluating the impact of the VIP analysis on Business Model design and implementation.*

Finally, in a post hoc analysis (i.e., a few months after the VIP analysis was completed and finalized), the case owners (or directors) were interviewed about the way the VIP analysis is used or adopted in the case, and the impact of the analysis on the Business Model design and implementation. As such, the effect of the analysis on the case has been evaluated.

The questions (with explanations) that facilitated the semi-structured interviews and collection of data throughout all four phases are presented in appendix A.

4.3 Case study preparation

According to Yin (2003, p. 78) "*a final preparation for data collection is the conduct of a pilot case study. The pilot case study may be chosen for several reasons unrelated to the criteria for selecting the final cases in the case study design. For example, the informants at the pilot site may be unusually congenial and accessible, or the site may be geographically convenient or may have an unusual amount of documentation and data.*" The pilot case study is not only a way to train the

researcher to identify and improve skills needed for conducting the case study, it also helps the researcher refine data collection plans with respect to the content of data and the procedure to be followed (Yin, 2003). For this reason, although in a preliminary fashion, the application of the newly introduced framework, i.e., the VIP framework is qualitatively evaluated, based on three innovative small-scale pilot studies, which were fully accessible to the author of this thesis (for the cases specification, see section 5.1).

The three innovative pilot cases were carried out by university-based teams, over a of six month period. The projects were proposed by a number of companies from various industries. The teams were supported by two coaches from the university and one or two coaches from the companies involved. Each team consisted of five students from different university departments, including industrial design, business and management and computer engineering. The pilot case study was conducted in four phases, reflecting the phases in a design process, i.e., ideation, conceptualization, implementation and commercialization.

In the *ideation* phase, traditional strategic stakeholder analyses were carried out: identification of the stakeholders, business requirements and priorities (as suggested by Freeman, 1984; Mason and Mitroff, 1981). In line with Mason and Mitroff (1981), Crosby (1992), and Enserink et al. (2010), the teams were requested to (1) define the problem, (2) identify the stakeholders, stakeholder interests and resources involved, (3) generate assumptions regarding stakeholder expectations (and requirements), and (4) evaluate the position of the various stakeholders (either in favor or against) with regard to project objectives. However, the teams were required to pose various VIP-related questions regarding the stakeholders operations in terms of value and information creation and exchange, and the shared business processes; not only to gain an in-depth understanding of the explicit business requirements of the stakeholders, but also to understand the less visible operational challenges.

In the *conceptualization* phase, the teams worked out their case Business Model, and described how the intended business concept would create and capture value for stakeholders involved (including users). Based on the VIP

framework, teams have also attempted to advance the operational models (from the previous step) by specifying the value objects, information resources, operational activities and processes, and information and communication systems.

Throughout the *implementation* phase, the teams focused primarily on implementing their business plan and on translating the business objectives into an operational/technical plan. Through iterative meetings, the teams attempted to identify the technical requirements, while involving the stakeholders in the technical (functional) design process. Different from the previous two steps, the teams used the VIP framework not to *describe* but to *analyze* the Business Model operational feasibility, by focusing on:

(1) the process of value creation, provision and capturing between the various stakeholders as well as value interdependencies, constrains and complexities,

(2) the process of information creation, access, and exchange and information interdependencies as well as informational interdependencies, constrains and complexities, and

(3) the primary inter-organizational business processes and the related interdependencies, constrains, and complexities.

In the *commercialization* phase, the teams were mainly focused on the presentation of their final solution and reaching to an agreement with the external project owners/managers on adoption and implementation of the case outcome.

Throughout the four phases, the application and added value of the VIP framework was evaluated through semi-structured interviews. The subjects were asked about their understanding of stakeholders before and after the VIP analysis, and whether the VIP diagrams has helped them better understand the interactions and interdependencies between stakeholders. In addition, during team meetings, the teams were observed on the ways they apply the framework, what they extracted out of the VIP analysis, and how the output is utilized. The insights from this preparatory experiment helped improve the design and execution of the succeeding large-scale case studies.

The next section provides a description of the pilot cases, discusses the lessons learned and how these new insights helped the author prepare the case studies.

4.4 The pilot case study

In this section, the case descriptions are provided (section 4.4.1), after which the findings of the pilot study are discussed (section 4.4.2).

4.4.1 Description of the pilot cases

The pilot includes three Smart Living-related cases, i.e., *mobility*, *energy* and *healthcare*. The Mobility case examined the possibilities to support car drivers by an automatic, or 'smart', merging on highways. The team analyzed various scenarios with regard to an ICT-supporting system to be used inside cars. Simulation tools were used in the implementation phase to assess and evaluate the proposed scenarios. The aim of the Energy case was to help a municipality in the Netherlands to become free of fossil fuel consumption by 2020. The goal was to develop a system that provides a real-time calculation and visualization of the financial impact of the green investments of the municipality and energy providers. The system was intended to be accessible via the Internet for all the stakeholders involved. The aim of the Health case was to develop a preventive health system application based on several gaming elements, designed to motivate and facilitate users to adopt a healthier life-style and at the same time improve communication between users and healthcare professionals (including life-style coaches), with the ultimate goal of improving the life-style of patients with diabetes and obesity.

As discussed in the previous chapter (section 4.3), the cases were divided into four phases, i.e., ideation, conceptualization, implementation and commercialization (for a detailed description case methods and outcomes, see Appendix C).

- In the *ideation* phase, by performing a stakeholder analysis, the teams developed a detailed picture of how teams involved stakeholders, where their focus was directed upon, and what the

outcome of their approach was throughout the different project phases. The teams used various sources (including several open and semi-structural interviews) to obtain a detailed insight into the stakeholders involved, including the users and their needs and limitations. Additionally, during the first phase, the teams and the industry and university partners carried out a preliminary literature review and an analysis of relevant legislation and regulation, local or national government policies, technology and market developments based on business reports, Internet resources and stakeholder websites. They also conducted (open) interviews with stakeholders, with the aim of writing an initial business plan, and talked to intended end-users, either face-to-face or via group interviews. In all cases, the focus was on understanding problem as well as legal and political boundaries of the design space (especially in Mobility and Energy projects) or the boundaries that existed as a result of relationship between doctors and patients (in de healthcare case). The business plans included an introduction, a problem statement and an initial stakeholder analysis as well as a market analysis and Business Model alternatives.

- In the *conceptualization* phase, teams discussed and described their intended business from four different Business Model perspectives: the service to be delivered, the technological architecture, organizational arrangements and finance (in accordance with the STOF model). Stakeholder and business requirements were essential in this phase of all the projects, with an emphasis on the financial and legal requirements in the Mobility case, (inter-organizational) information system interoperability in the Energy case and the relevance of gaming in Healthcare case. In the healthcare project, storyboard sessions with end-users were organized. Information that was needed to formulate and to agree on the Business Model made it necessary to conduct another round of interviews with stakeholders, especially with the leading company.
- In the *implementation* phase, in close collaboration with the stakeholders, especially the leading partner, the teams tested or evaluated their ideas in pilot studies, simulation and interviews. The

teams extended their analysis by focusing on the operational business processes, which stakeholders have or need to have to realize their business needs. Also, the alignment between the previously defined Business Model and the established infrastructure, systems and processes of the stakeholders, was a subject of analysis. The teams visualized their findings through different VIP diagrams, depicting various processes and activities on all three VIP levels. The analysis was supported by joint drawing sessions in which stakeholders were involved.

- In the *commercialization* phase, the teams presented their fully worked out business concepts, which include a simulation of several fully automated merging processes in the Mobility case, an innovative green investment calculating software in the Energy team, and a life-style care platform with innovative gaming elements in the Health team.

The next section discusses the outcome of the pilot study as far as it is relevant to improving the case study approach and execution.

4.4.2 The findings of the pilot case study

The pilot studies illustrated the importance of making both strategic and operational stakeholder relationships explicit. The VIP model made it possible to reveal conflicting interests and conflicting operational processes. Moreover, as the cases were progressing towards the implementation and commercialization phase, the simple business concept behind the cases became detailed sets of actions and processes. By jointly developing the VIP diagrams, the teams were forced to consider stakeholder interactions and relationships, information resource dependencies and primary business processes in greater detail. For instance, according to one participant in the Mobility project "*the analysis gave us a broad and factual view of stakeholders interactions, which sometimes was in contrast with our intuitive image of reality…*", while a participant in the Energy team made a similar remark regarding the level of detail of the insights that had been generated. It also helped the teams identify the core actors and their relationships with the other stakeholders: "*the analysis gave us the chance to think how the business*

processes of different stakeholders could be connected to each other… and how operational processes were intertwined with the information flow", according to one participant in energy project. In short, the interviewees indicated that their experiences of the teams with the model and diagrams were generally positive. "*Although…the model was applied to explore the network of stakeholders, we also reconsidered to model to evaluate our service. We needed the analysis to reveal the patient groups and related organizations, and their relations and interactions*." It is interesting to note that some of the VIP diagrams seem to be more useful than others. For example, the Energy project benefited more from the identification of value and information exchange, while the detailed analysis of the stakeholders' business processes turned out to be less relevant. Nevertheless, the combination of all three domains made it possible to arrive at a comprehensive view of the value and information being exchanged between primary stakeholders and their operational interactions. Furthermore, based on the periodic interviews with the team members, it became apparent that their perceptions of the sequence, connectedness and complementariness of VIP domains and their components were positive. The drawing sessions and analysis helped the teams reveal and anticipate operational conflicts, complexities and/or problematic dependencies between the various stakeholders. For instance, the diagrams of the healthcare case emphasized the central role of the core service provider in the process of value creation, whereas the development of hardware and software plays a minor role.

There were also several complaints and criticisms about the VIP and the VIP-based analysis:

> ***Interpretation***. One issue was the interpretation of some of the VIP components, for instance when discussing value exchange. Throughout the analysis, the concept of value is interpreted in different ways. The team discovered that some stakeholders associate value with tangible values, while other stakeholders emphasize intangible benefits. Accordingly, the team adapted their model to cover both types of values.

Specification. The level of detail with which the VIP concepts had to be described was not always clear. The teams had difficulties to determine how detailed the process specification should be. In interviews, several members have indicated that not all processes and process specifications were relevant for the analysis. A few times, the teams had to dig deep into processes (for example, a detailed specification of the stakeholders shared access points to the patient information database), however, in general, merely those processes related to value creation, provision and capturing, needed to be specified.

Timing. The extent of perceived relevance and usefulness of the VIP analysis vary in different phases. In the interviews, the analysis is underlined to be mainly useful during the implementation phase, when the teams had elaborated a mature Business Model, and a majority of the stakeholders were acquainted with and involved in the case.

Visualization. Another issue was the modeling approach used to visualize the VIP related processes and activities. No tool was provided to the teams; instead, they were requested to apply their own intuitive approach to visualize the analysis. In the end, all three teams were unanimously of the opinion that a uniform visualization method, which should include all aspects of the VIP framework and can be re-used during iterative interviews with stakeholders, is strongly needed. Several team members emphasized that a comprehensive VIP visualization would have helped them as well as the stakeholders oversee the complex inter-organizational interactions, from which critical and problematic processes can be extracted.

Based on the criticism, several measures were taken before conducting the case studies:

(1) Regarding the interpretation problem, all the definitions of the VIP components (as provided in chapter three) were re-inspected and wherever needed redefined.
(2) To avoid any misunderstanding about the core concepts of this research during the succeeding case studies, the concept definitions (including Business Model, in/tangible value, information, primary business processes, dependency, implementation) were described to the interviewees, complemented with several examples, before and during the interviews.
(3) To deal with the specification problem, the focus was kept on primary processes, exchanges, activities, objects and systems that exist or are necessary to enable the Business Model.
(4) The VIP analysis is perceived as most useful during the implementation phase, when the ideation phase (e.g., the design and development of Business Model) is completed. Accordingly, the phase the successive case studies are in, at the time of study, should be taken into account.

To tackle the visualization issue, in close collaboration with the stakeholders, simple VIP diagrams were co-created, in which the core interactions and interdependencies within and between stakeholders are represented.

Chapter 5. Case Studies

"... [t]he totality is not, as it were, a mere heap, but the whole is something besides the parts ..."

Attributed to Aristotle (Cohen, 2012)

This research is based on four case studies in the Smart Living (healthcare) domain. In line with the data collection and data analysis steps discussed in the previous chapter (see section 4.2: cases study protocol), this chapter discusses the case studies and case study analyses, which are structured as follows:

1) The Business Model of each case has been crafted in accordance with:
   a. the Canvas framework for the Physical Activity Prescription case (Turku, Finland) and the Electronic Medicine Dispenser case (The Hague, The Netherlands) (sections 5.1.1 and 5.2.1), and,
   b. the STOF framework for the Independent Living Project case (Helsinki, Finland) and the Home-based Senior Care case (Wuhan, China) (sections 5.3.1 and 5.4.1).
2) The VIP framework is used to specify Business Model description for each case with business activities, processes, interactions, and interdependencies within and between stakeholders (sections 5.1.2, 5.2.2, 5.3.2, and 5.4.2), and,
3) An analysis of the Business Model implementation, aiming at identification of critical, problematic, or conflicting operational

Various parts of this chapter and chapter six are submitted to the European Journal of Information Systems (EJIS) and published by the Journal of Information Systems Frontiers (ISF) and Electronic Markets (EM). I would like to express my gratitude to the anonymous editors of all the three journals, the editors of EJIS, ISF and Prof. Ulrike E. Lechner (EM), as well as my colleagues Dr. Marikka Heikkilä, Timo Itälä and Dr. Nick Guldemond for their critical, yet constructive reviews and feedbacks.

business processes that dilute Business Model feasibility (sections 5.1.3, 5.2.3, 5.3.3, and 5.4.3).

4) Each case analysis is concluded with a discussion on how case idiosyncrasies (e.g., number of stakeholders involved, stakeholders diversity, stakeholder competition, interdependencies, culture) have or may have influenced our case study analysis (sections 5.1.4, 5.2.4, 5.3.4, and 5.4.4).

For the sake of confidentiality, for all four cases and stakeholders involved, fictitious names are used.

5.1 Physical Activity Prescription (PAP)

According to the case initiator (who has a background in physical education and professional sports), health-improving initiatives are urgently needed in Finland, not only to continue the health movement that started in the 80's[2], but also because there are still serious health issues that need to be tackled. Examples are the high obesity rate among Finnish adults 20.2%, which is higher than the OECD average of 17.8% (OECD, 2011), the large number of type II diabetes (Lammi *et al.*, 2007), and the ever-increasing aging population in Finland (Kunz, 2007). In response to the deteriorating public health, the case initiator intended to use his professional network and experience to set up an innovative case that aims at improving public health by adding (medically advisable) physical activities to medical doctors prescriptions. In this way, citizens will be encouraged to exercise more and to learn appropriate physical movements.

5.1.1 A descriptive representation of the case Business Model

Next, the eight core elements of the Business Model according to Canvas are discussed.

[2] By the late 1980s, the mortality rate from cardiovascular diseases in Finland was among the world's highest for both sexes. A national diet rich in fats was seen by medical specialists as a cause of the prevalence of coronary illnesses (Solsten and Meditz, 1989).

Value Propositions. The goal of the Physical Activity Prescription (PAP) project is to enable Medical Doctors (MDs) to prescribe medically reliable physical sports and exercises, in order to improve the customers' physical health. The customers in question are employees from companies (B2C) that, in turn, are customers of one of the largest occupational healthcare service providers (B2B) in Finland. The project creates value for all the stakeholders involved (Table 2).

Customer Segments. End-users need to visit a doctor for a specific medical reason. The PAP service will first be available as an occupational health service, which can be scaled up. The service focuses on preventing health issues (e.g. obesity, type 2 diabetes) that are typical for Western industrialized countries.

Customer Relationships. Through dedicated personalized attention from MDs and pharmacists, patients' problem(s) are identified, after which customized physical activity programs are provided. Special training is provided to MDs and pharmacists to train them with regard to well-being and physical activities, cutting-edge support technologies, and how to address patients.

Channels. Medical doctors and pharmacists are the primary channels through which medical knowledge and supporting products are delivered to customers. In interviews, a common service platform is suggested as a possible medium for multiple services from various providers.

Key Activities. Key activities are prescribing physical activities to patients, measuring patient well-being (e.g. body age index, body mass index, body fat percentage), storing patient data in a central database (Figure 5.1), and periodic control, to motivate the patients further, while providing them with guidance and planning throughout the process.

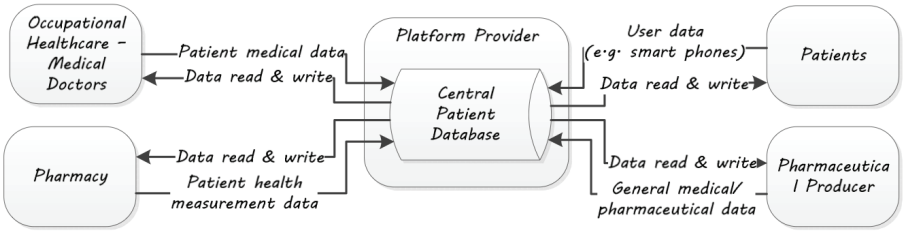


Figure 5.1 Data flow and the central database

Key Resources. The project has a network of several cooperative medical doctors (affiliated to one of Finland's leading occupational healthcare providers), one of the largest of pharmacy chains in Finland, and a company that provides training courses and workshops to doctors and pharmacies. Also, an international pharmaceutical company producing generic drugs and specialty pharmaceuticals is involved. The project is co-funded by one of the biggest Finnish government innovation and research funds, which covers some of the project's expenses throughout the initial phase.

Key Partners. The stakeholders are presented in Table 5.1.

Cost Structure. Core costs are staff salary (including trainers, marketers, sales people, technicians, coordinators, etc.), development of the service platform (if agreed upon, these costs can be shared with the healthcare provider), maintenance of user data and data regarding predefined prescriptions, and integration of platform with the partners information systems.

Revenue Model. Revenues are generated by the premium services provided to users and providers (e.g., Pay-per-Click payment to download prescriptions), sales of aggregated and analyzed data (e.g., aggregated reports), advertisements (e.g., advertising sponsors such as health clubs), and the training provided to pharmacies and medical doctors.

Table 5.1 The value add to stakeholders

Stakeholders	Value creating potential
The patient	Medical doctors prescribe patient physical exercises. The changes in physical wellbeing are measured regularly at a pharmacy and the patient is also encouraged to increase his or her physical activity level. Inferred from the interviews, the underlying presumption is that getting a prescription from medical doctors will make patients more committed to

	increase physical activities, which will improve their physical and mental well-being.
The employer	Since the patients are employees, improving their lifestyle will improve their performance and attendance, mental stability, happiness, etc.
Occupational healthcare provider	The medical doctor may charge the patient (who will charge the employer or insurance company) for the additional treatments and extended prescriptions.
Pharmacy	More customers will visit pharmacies, providing an opportunity to offer a new range of products and services to the customers.
Sport Centers	Provide sport equipment and coaches.
IT developer	Responsible for the adjustment and integration of companies information systems with the PAP service platform (for example the connection between the MDs' systems with the service platform), and the technical maintenance of the service platform.
Equipment provider	Responsible for delivering measurement devices to pharmacies.
Pharmacy Training Company	Re-education and training of MDs and pharmacies and the developer of prescription forms (to be used in the platform by medical doctors).
Pharmaceutical producer	Delivering new pharmaceutical products and services to pharmacies.
University	Because the case is partly funded by the government, a university is involved in this case as well. The university supports the project by investigating various topics (e.g., marketing, internationalization, technical developments). Although university-based researchers were a rich source of information, they were neither directly involved in the process of Business Modeling nor Business Model operationalization and operational processes.
Government	In line with Finnish government health policies, this initiative improves the health of the country's citizens, which is why one of the main Finnish government's innovation and research funding institutes cooperates in this project.

Based on the described Business Model Canvas the highlights are presented in Figure 5.2. The Business Model Canvas helped summarize the extensive discussions on the Business Model behind the case. Once the Business Model Canvas was developed, it helped the interviewer guide the succeeding interviews and to discuss various key aspects of the Business Model. Iteratively, the Business Model Canvas has been evaluated and validated by the interviewees.

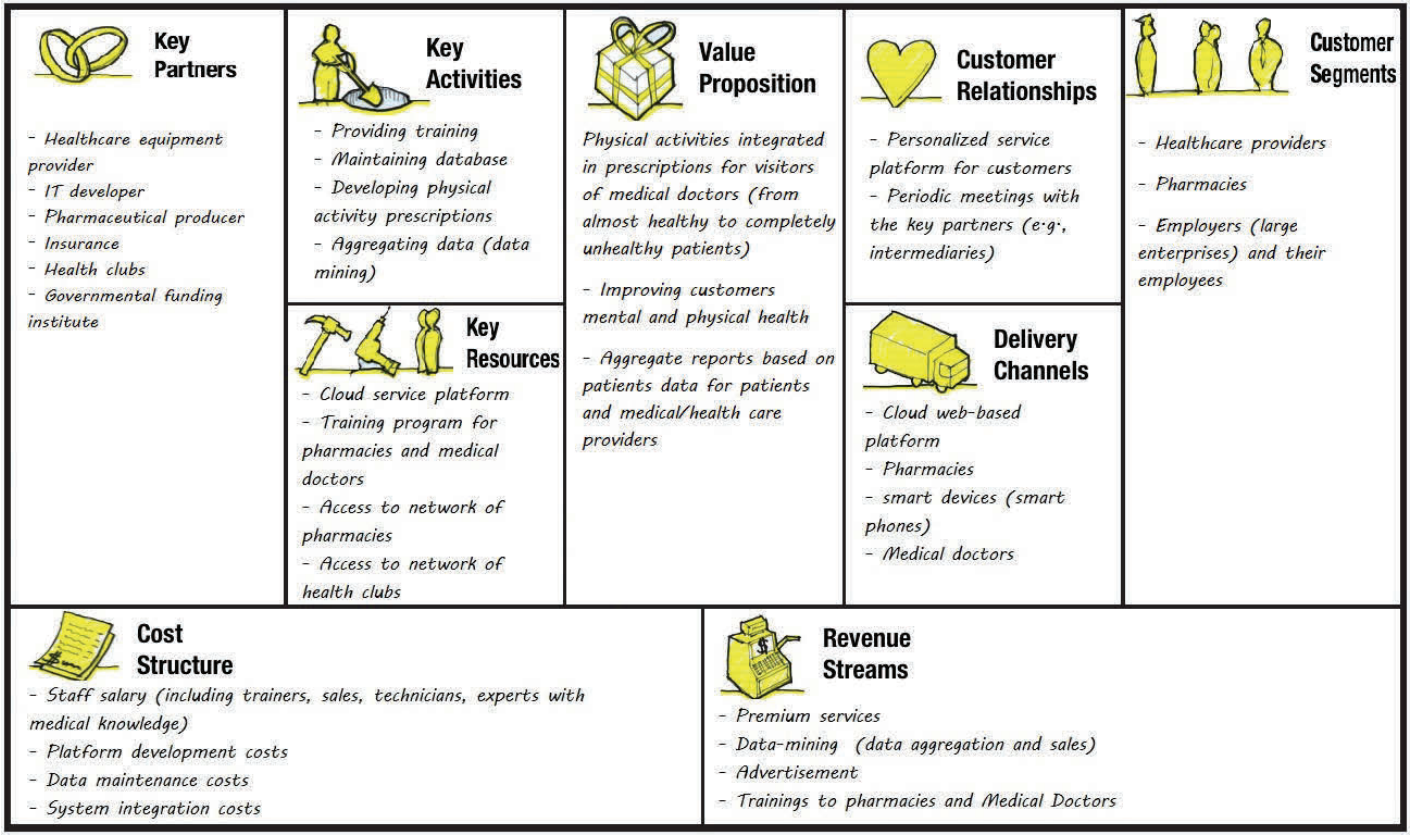


Figure 5.2 The highlights of the case Business Model (PAP)
(Canvas template can be retrieved from www.businessmodelgeneration.com)

5.1.2 A descriptive representation of the Business Model operationalization

Next, the Business Model is extended and specified with the help of the VIP related questions. Together with the interviewees, during the interviews, the VIP interaction diagram is developed (Figure 5.3). The diagram contains all the vital inter-organizational interactions, required to implement the Business Model. The squares represent the stakeholders, while the lines represent the core interrelations and business processes between them.

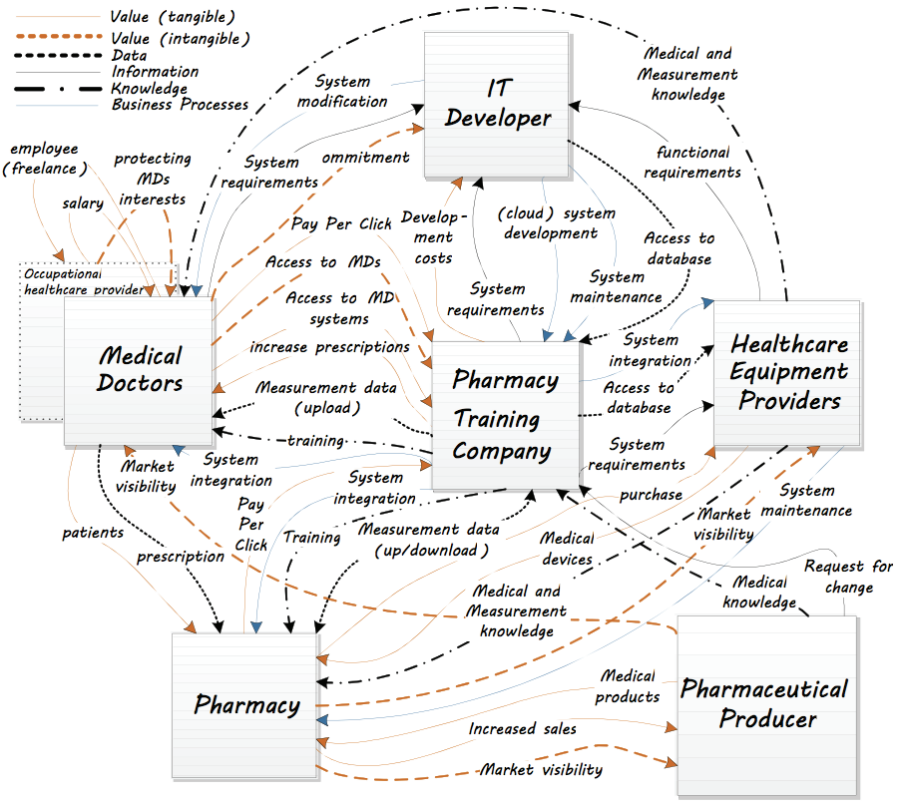


Figure 5.3 The VIP interactions diagram

Figure 5.3 shows that a great deal of interactions are between platform provider (in the center) and the surrounding stakeholders. The diagram

shows a relatively large number of value-based interactions between platform provider and the occupational healthcare provider (and their medical doctors), and mostly information and process related interactions linking platform provider to the other four stakeholders. This is in line with stakeholder description in previous section, which indicates the fundamental role of platform provider and occupational healthcare provider (including the medical doctors) upon which the Business Model concept is relying on (represented by value creation and provision activities), and the necessary role of the other stakeholders who enable and support the Business Model implementation (represented by creation and exchange of information, and inter/intra-organizational business processes). In addition, the diagram shows that in varying degrees, almost all types of interactions (i.e., value, data, information, knowledge, process) exist between stakeholders. Furthermore, the diagram shows a reciprocal relationship between the interacting stakeholders.

Figure 5.4 represent the inter-organizational interactions in more detail and shows how stakeholders are linked to value and information object and multi-level activities and processes, in order to achieve value propositions. Especially, links between interactions at various levels are further specified (i.e., the way interactions are causing, caused by, influencing, or related to other interactions within and between the VIP levels). Also, the dependencies between activities (i.e., activity and process flow), stakeholders' responsibilities (i.e., the colored activities corresponds with stakeholders color), clusters of interrelated activities and processes (the dotted-line circles) are depicted. As discussed in the previous chapter, the diagrams are developed, reviewed and validated by the interviewees, which, in turn, has helped them (re-) formulate the core value propositions, value and information objects, activities and processes as well as to identify several Business Model implementation hindrances (which will be discussed in the next section), at various VIP levels.

A remarkable issue during the VIP drawing sessions was that some of the respondents persist in drawing *overlapping* dotted-line circles (i.e., process boundaries) to imply the overlapping, undecided, and sometimes vague

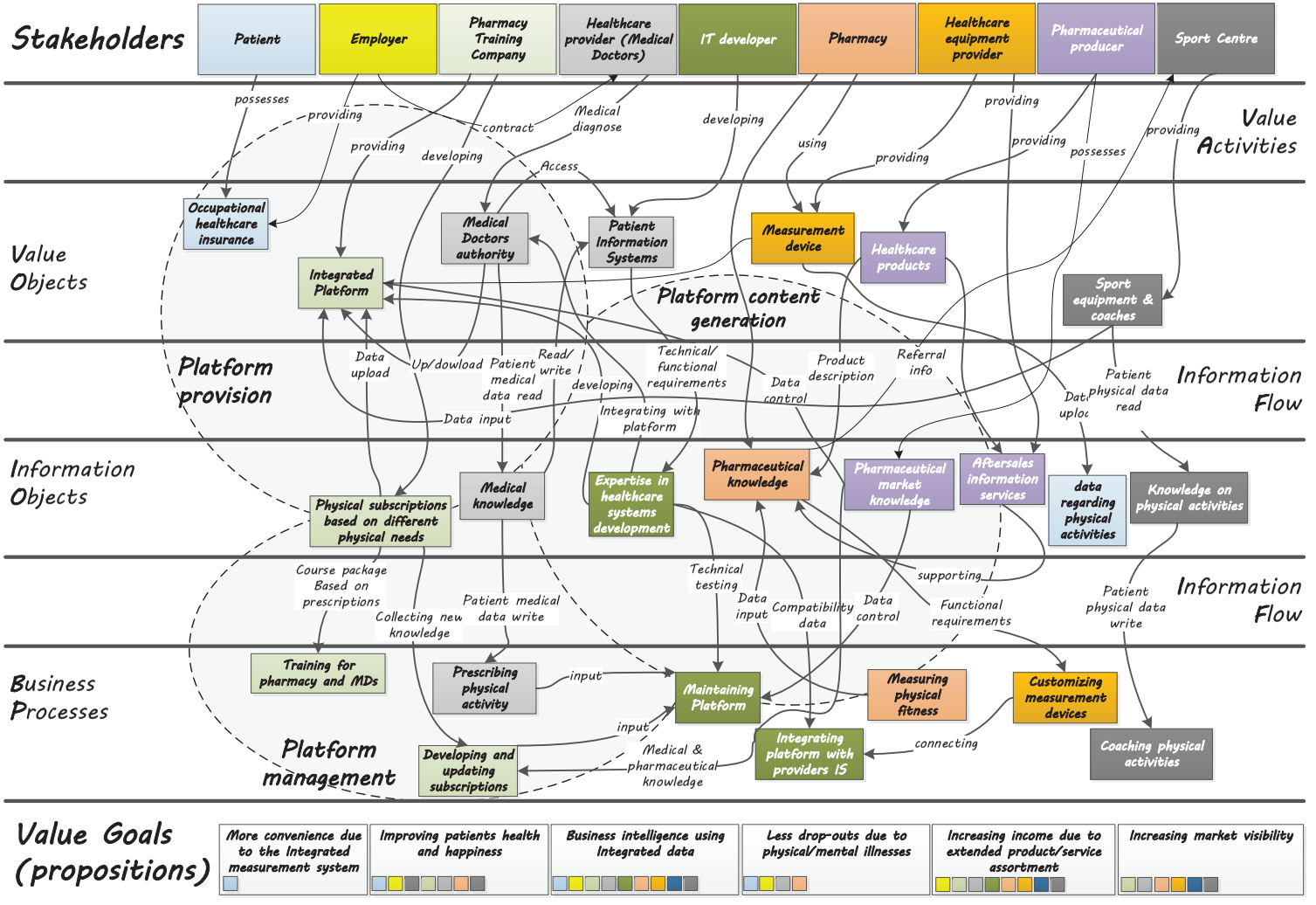


Figure 5.4 The VIP interdependencies diagram

division of roles and responsibilities. The diagram shows that some stakeholders are primarily active at information exchange and process level (e.g., the IT developer), some more at value and information level (e.g., pharmaceutical producer), and some at all levels, such as the platform provider and healthcare provider(s). In addition to figure 5.3, patients perspective is added in this diagram, to indicate which stakeholder(s) interact(s) with customers, which, in turn, helps clarify the organizations position within the network. Finally, the diagram includes a few central nodes within the diagram, to which several objects and activities are connected or dependent upon. Examples are the central position of platform, patient information system, and the IT developer knowledge about medical system development, systems interoperability, and system maintenance. In the next sections, these issues will be discussed in more details.

5.1.3 An analytical representation of the case Business Model implementation

In the previous two sections, the case Business Model, operational processes, interactions and interdependencies between stakeholders were *described*. In this section, the case Business Model implementation is *analyzed*, i.e., identification of hindrances on three VIP levels (for more detailed discussion on analysis approach, see chapter 4, as well as interview questions appendix A).

Value creation, exchange and capturing

Except from the Pharmacy Training Company that initiated the PAP concept, stakeholders are skeptical about the value-creating potential of the concept. According to some interviewees, this uncertainty is related, among other things, to its financial viability.

> *v1. "... it is uncertain if patients usage and the money they bring in the network will exceed the system development costs. {PM – Project Manager}*

> *v2. "... the question is whether enough patients will accept to visit a pharmacy to do the test and pay for it, which would cover the costs made by us [pharmacist] to purchase the measurement devices." {PH - Pharmacist}*

v3. " ... we have all the Lego blocks, we can actually build the process, but are we all going to have our shares?" {SD – Service Development Director}

The lack of understanding with regard to the dynamic business objectives of stakeholders involved also creates uncertainty, especially in this project, which involves a range of stakeholders from highly different industries. The reason is that a dynamic and heterogeneous network makes it difficult to identify the roles and responsibilities, scope the project and outline an implementation plan across the entire project (see also quote i9).

v4. "We have several stakeholders in this complicated network, we have the pharmacy side, medical doctors, service providers who evaluate whether prescriptions are used, and us...it is not clear which value propositions all these actors, individually and collectively, are focusing on now, and if these values will be different in future."{SD – Service Development Director}

v5. "well, if we had a more concrete view, a shared vision on each others' roles, so that we could say hey, you bring that piece; we bring these pieces, in order to achieve a functioning end result. Then the pieces are clear and we know who to contact in order to carry on. That is something that maybe could be improved, I mean the understanding of each others' roles." {SMP – Sales and Marketing}

In addition, there is a considerable lack of insight in customer demand, which also makes it difficult to predict the value-adding potential of the Business Model in question, which, in turn, means that broad market diffusion and user acceptance remain serious challenges.

v6. "We need to investigate the users more seriously. We do not know how they will react to this concept. We have collaborations with health clubs, where the physiotherapists refer their patients. They [the physiotherapists] also accompany the patient during the first visit(s) to the gym. Perhaps it might be easier for the patients to visit our physiotherapists and to get the measurement in the same building as the medical doctors." {SD – Service Development Director}

The process of value creation and exchange within and between stakeholders clearly needs to be orchestrated. One example is that

stakeholders need to determine whether (and how) a service platform may provide a solution by providing multiple services from various providers. The need to create a consensus to provide services via a shared service platform has direct consequences for the Business Model and the way resources will be co-created by and exchanged or shared between stakeholders.

> *v7. " In my opinion, having the physical exercises on prescriptions is the trigger of the preventive treatment chain. But we need more. We need to motivate the patient to keep up exercising, by using an app [mobile application], for example, or anything else. Also, the control of what a patient is doing is an important task that we need to take into account... All these services, either in-house or outsourced, can be stored on our platform or on third-party platforms...but this is something that we yet need to understand and decide."{SD – Service Development Director}*

Immediately, the question arises as to who should be the platform data owner, the pharmaceutical company or the occupational healthcare provider. Should PAP data be under patient control, but exclusively supervised by the medical doctors (or any other actor), which would imply a semi-open platform, or should it be an open service platform on which any provider (healthcare providers, physical therapists, pharmaceutical service providers) can offer products and services. Stakeholders need to come to an agreement and decide who will own which resources (e.g., the PAP platform), how resources will be exchanged and what the revenues will be.

> *v8. "... to implement this concept, various resources and knowledge are needed...they [healthcare providers] will bring a lot of credibility and agility to this project, which makes it possible to roll out the project nationally... But to me, it is a dilemma if a person like John [The case initiator, and the director of Pharmacy Training Company] will not accept to be the owner of the platform, or will they [the healthcare providers] look forward to share the system, or they may both aim to develop a totally open system..." {OM – Operational Manager}*

In a similar way the project initiator was skeptical about the occupational care provider, with regard to their inflexible and counter-innovative attitude.

> *v9. "… I'm doing my best, first, to find the right person with the needed authority and expertise in this enormous enterprise [occupational care provider], and second, to get this concept on his/her agenda, which is even more challenging, typically in the health sector, and especially in this organization, which is dominated by bureaucracy, hierarchy, rules, and a conservative and unresponsive attitude towards innovation." {PI – The Project Initiator}*

According to the service development manager of the occupational healthcare provider, there are questions regarding the monetary value streams that need to be addressed:

> *v10. "... as such [following quote v7], it is not clear who makes money and how? And this is one of the most relevant questions that we still cannot clearly define. This is basically the money flow, who will pay, and who will get?". {SD – Service Development Director}*

Without a clear vision on this issue, it is hard to identify organizational interdependencies, roles and responsibilities. Similarly, the allocation and flow of resources are difficult to establish.

Information creation, access, and exchange

Creation, access, ownership and the exchange of information and knowledge cause a number of severe complications with regard to implementation of the Business Model. For example, there are at least two stakeholders (i.e., the healthcare provider and Pharmacy Training Company) who are keen to acquire ownership of patient data, one of the core assets.

> *i1. "the pharmacy, platform provider, and others, are interested in patient data, but we are interested in the database as well...". {SD – Service Development Director}*

i2. "Ownership of the database in not clear! But it is one of the most important sources of revenue....". {PI – The Project Initiator}

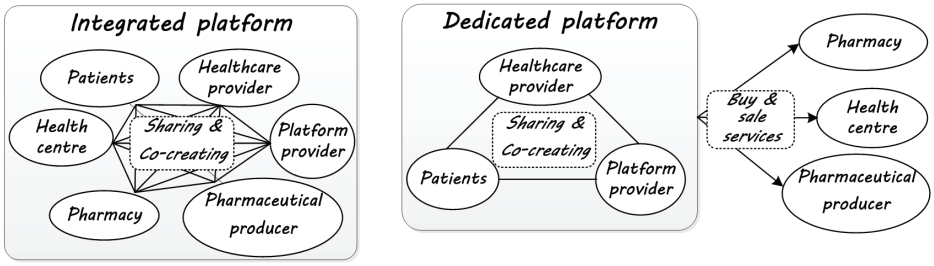
i3. "The service [PAP] as such, is highly dependent on occupational healthcare providers for gaining access to the systems of medical doctors. Without that access, the database provides an incomplete picture of the patient". {PI – The Project Initiator}

A lack of agreement regarding the ownership of the data has an impact on information flow. For instance, the healthcare provider emphasizes that it is not clear who has authority over which information and who decides which data should be stored or shared.

i4. "the prescriptions and medical information should be stored in our medical patient information system; however, we do not need to store the results of the physical exercises in our systems. That should be stored in a different database, owned by a third trusted party or the patients themselves. In a same way, for example, information regarding antibiotics will be stored in the medical system, but whether you have consumed the antibiotics and how many of them and what time are not stored in our system... there are other possible variations, which we need to evaluate and agree upon.". {SD – Service Development Director}

Platform openness (see quotes v7 and v8) affects the collection and exchange of data between stakeholders and patients. The platform becomes an extension of healthcare services (i.e., a dedicated platform), where patients can buy services from other organizations, such as pharmacies, pharmaceutical product providers, health club facilities, or an integrated service chain (i.e., an integrated platform). As a consequence, multiple providers will own the platform where interconnected information systems provide integrated services (Figure 5.5). In the integrated system, all providers contribute to platform development and share the benefits and risks, while, on the dedicated platform, the costs and benefits are for the platform owner (i.e., healthcare provider) and/or platform provider (i.e., Pharmacy Training Company).

i5. "the medical doctors will issue a prescription, which will be stored on our system; but this information will be sent to another system (physiotherapist, pharmacy, gym, etc.) and patients should be able to access this second system throughout their lives.... In a similar way, the measurement comes from the doctors, but also from the health clubs or the patients themselves. This means that it is not a prescription system, but rather a motivational platform, that not only helps the patient to start the physical exercises, but to keep doing them in the future as well, comparable to Endomondo [which is a sports community based on free real-time GPS tracking of running, cycling, etc.]." {SD – Service Development Director}



Open integrated platform **Semi-closed dedicated platform**

Figure 5.5 Different platform architectures

In addition, privacy and security of the PAP platform, which contains all kinds of sensitive information (including patient data), is under discussion. According to the operational manager, the risks and threats need to be identified and evaluated, and measures are needed to preserve patient privacy and system security.

i6. "A lot can be done with data but that is a risk at the same time. We need to find out what threats there are and how these threats might affect our business." {OM – Operational Manager}

A lack of knowledge is another serious issue in this project. According to one of the interviewees, pharmacies are a less intuitive choice as intermediaries between MDs and sports centers. Their lack of knowledge regarding physical activities may affect the service quality, which is not in the patient's interest.

i7. "The patient should go to a pharmacy to get advice regarding physical exercises, but in my opinion, they [pharmacists] are no experts in this area. I trust them telling me about antibiotics, but not how I should move... sometimes the medical doctors need to send their patient to an expert on physical activities, like a physiotherapist or personal trainer (at a gym), but not to a pharmacist." {SD – Service Development Director}

One of pharmacists confirmed this shortcoming and added that, in addition to knowledge on physical exercises and rehabilitation, information regarding local sport centers and health clubs is needed, as well as indicative customer service and engagement guidelines to service patients with specific disabilities (such as patients with mental disabilities):

i8. "We need the training in order to approach our customer properly and provide them with adequate information about how to move, exercise and so on... we advise patients and if they want to follow up, they will need information regarding sport centers, which we do not have!" {PH - Pharmacist}

i9. "Accepting patients with mental disabilities or instabilities or with drug addiction may present us with problems. Note that it is exactly these patients who may need more physical exercise. We need to discuss with the partners how to deal with this." {PH - Pharmacist}

Primary business processes

Many of the issues discussed above also play a role (or live on) at a process level. For example, due to the complexity of the business ecosystem (see quote 4v), there are reasons for concern regarding the systems integration. In particular the discussion presented above regarding platform ownership, data ownership and platform openness (quotes v7, v8, and i5) has consequences with regard to which of the processes need to be shared (or integrated) between actors, and how.

p1. "Of course, the connection or integration of the healthcare provider [Information System] and CRM [Customer Relationship Management] systems with the PAP platform, which include the prescriptions and patient data, is complex or challenging, but with a good planning, together with

them [the healthcare provider], we can deal with it...." {PI – The Project Initiator}

In addition, undefined roles and responsibilities (quotes v5, v8 and i5) lead to unknown inter-organizational processes and process boundaries. According to the service development director of the healthcare provider, attention has to be paid to the alignment of processes and activities that transcend the boundaries of the companies involved, for instance a coherent patient measurement protocol that enables the collection and exchange of various types of data between stakeholders, and even with patients. Accordingly, the dotted ovals in figure 4, indicating the process units, overlap. The interviewees could not specify the process boundaries.

p2. "...in such a network [see quote v4], the roles within the value chain should be specified. So for example, if your give patients the prescriptions and send them to pharmacy, then they will do some measurements, but we also want to do the measurements! Who decides what these measurements should be? And at what point are these measurements no longer medical data, but more related to the well-being services? And why shouldn't we be able to do that? In short, it should become clear where our jurisdiction ends and where the others' start in order to plan the required future activities... on the other hand, it is not clear what the prescription is exactly. Is it piece of paper that you can put it in your pocket and forget about? Or is it something that can be traced, monitored, etc.? It [the prescription] also should contain enough information, not only 'go to gym'. It has to be specific." {SD – Service Development Director}

Also, in the interest of the customers, such an inter-organizational process orchestration is crucial in enabling patient identification and traceability. This process level issue has an effect on information architecture and information access at the information level, as the platform provider needs to identify the required information objects and information access points (e.g., the information owner) to enable patient data traceability (e.g., quote i4). In turn, at the value level, new kinds of value dependencies may come into existence, such as a new contract with employers to gain access to the needed information (quote v5).

p3. "If a medical doctor sends a patient to physiotherapy, health center, gym or wherever, the same medical doctor should remain responsible for the whole trajectory. In case we send a patient to the gym, and the patient gets a heart attack, we need to be able to trace where in system we have failed or how we should help the patient better. " {SD – Service Development Director}

P4. "Changing employer or pharmacy may lead to conflicting information or untraceable patient data." {PM – Project Manager}

According to the healthcare provider, a lack of coordination at a process level causes a suboptimal collaboration and process integration. In his words, the companies will excel in their own processes, instead of aiming for inter-organizational collaboration and, ultimately, creating a synergy that will benefit the customers.

p5. "One of my fears is that we start to optimize partially! Pharmacists will start to optimize their things, IT developers will optimize their systems, platform provider the same, and we, as the biggest player, we will optimize only our part." {SD – Service Development Director}

The head of sales and marketing of pharmacy chain argues that the lack of coordination and communication creates uncertainty at an operational level.

p6. "There is some uncertainty in the project as you don't know what the others have done since the last meeting, has something came up that would hinder the project or something that would speed it up. This is not mistrust but uncertainty." {SMP – Sales and Marketing}

Finally, the operational arrangement of the PAP service concept contains various conflicting issues, for example the decision whether or not to extend the existing medical doctors information systems, or to develop an external PAP platform instead (also quote v8), and the process alignment between different systems (e.g., medical doctors' patient system, pharmacy measurement devices, platform data entry, or patients smart phones) (see also quote p1).

p7. "There is a system integration dilemma, we do not want to put more things in our system but at the same time, we do not want to do things

outside the system, for instance a platform in the cloud!" {SD – Service Development Director}

So far, by following the VIP components, the implementation the Business Model of this case is analyzed at value, information and process levels. According to the interviewees, a lack of attention to any of these issues is expected to cause severe problems with regard to the Business Model implementation. The next section provides an overall interpretation of the findings and striking patterns in the case analysis, especially with regard to various peculiarities of the case (including case complexity, stage of project, leadership, and culture).

5.1.4 Conclusion

During the VIP drawing sessions and interviews, several critical issues, mainly at the value level, were identified that actually impede (or may impede) the implementation of the initial Business Model. While some of these issues were independent (i.e., are not causing or caused by other issues at the other levels) (e.g., i9 and p6), some were interrelated to - or even caused by - problems at the other levels. The chains of identified issues were either:

1) top-down, i.e., a problem at the lower levels is inherited or caused at the higher levels. For example, an unclear and undecided business structure (v7 and v8) caused vagueness with regard to information architecture (quote i5), and system integration on process level (p1),

2) bottom-up, i.e., problems at the higher levels are caused at the lower levels. For example, the patient traceability function (p4) requires access to employers information systems (i4), which, in turn, requires official contracts between platform provider and employers (v5), or,

3) within-level, i.e., problem chains within one of the VIP levels. For example, the unclear revenue model of stakeholders (v9) due to a lack of consensus on service model (v7) together with (or caused by) complicated network of stakeholders (v4).

The nature, cause and impact of the issues are highly diverse, so it is hard to prioritize or compare these issues or their impact on the Business Model. None of the interviewees has marked the number of stakeholders involved as a cause of complexity of Business Model implementation. Instead, one of the interviewees referred to the complex value flow and value interdependencies between stakeholders due to the high heterogeneity of stakeholders interests (v4). Two interviewees were skeptical about the role of the case initiator as the leader of the project (who is been marked as a close, reserved and over-towards protective), which may not be effective within a networked collaboration (e.g., v8). Although no specific questions were asked with regard to other case idiosyncrasies, such as local legislation, the prevailing culture in health sector or country, the subject of the case, the stage of project (i.e., exploration in this case), or the financial structure of the case (i.e., for-profit), the data does not indicate any immediate (or plausible) causalities that (may) impede of complicate the implementation of Business Model.

In the post hoc evaluation regarding the impact of the VIP analysis on the case progress and the implementation of the Business Model, one of the managers (from the platform provider side) stated that the VIP analyses were further investigated by the stakeholders involved, and it helped the stakeholders explicate their implementation strategy: "*we have organized a workshop, where we discussed the concerns raised by the analysis. While taking these issues into account (for example the concerns on expertise of pharmacies to provide advice on sports etc.), we collectively redrew the Business Model canvas. Some of the implementation issues are included in our formal agreements. We have decided to pilot the service with a few medical doctors, only one well-trained pharmacy, equipped with the measurement device, without the IT systems of the stakeholders involved being interconnected yet…The analysis enforced us to become more focused on and critical about the operations and activities that are required to run the project, something that we had not spend much attention on.*"

5.2 Electronic Medicine Dispenser (EMD)

The case owner aimed at increasing independence of the elderly, at an affordable price for the customer, and a feasible cost structure for him as a provider. In the Netherlands, the government, insurance companies, and healthcare providers considers these initiatives as highly necessary, as the country faces a growing aging population[1], and increasing health and care costs (Van der Horst *et al.*, 2011). Accordingly, the goals of this case are twofold, to increase the independency of elderly customers and reduce the costs of elderly care. The next sections describe the Business Model and underlying business processes of this case.

5.2.1 A descriptive representation of the case Business Model

Similar to the previous case, the Canvas model is used to structure the case Business Model description.

Value Propositions. The project owner (i.e., the care provider for the elderly) aims at improving its customers independent living by enabling them to autonomously take their medicine. Together with a number of companies, an advanced dispenser will be provided to customers, in order to help them taking their medicine on time. The dispenser will be connected to an alarm center and will be programmable through an online portal. Enabling customers to become more independent renders (some of) the periodic visits of caregivers unnecessary, also leading to cost savings on traveling expenses. At the same time, the companies involved in this case positions themselves as one the first movers (in terms of innovative and customer-centric) in the elderly care business market.

Customer Segments. The customers are elderly or disabled patients with a so-called CIZ-indication, who are eligible for administering medicine at home. The CIZ[2] (*Dutch: Centrum Indicatiestelling Zorg)* is a Dutch independent organization responsible for determining impartially,

[1] http://www.cbs.nl/nl-NL/menu/themas/bevolking/publicaties/artikelen/archief/2003/2003-1175-wm.htm (A recent report of Statistics Netherlands)(*dutch)*
[2] http://www.ciz.nl/awbz-zorg (*dutch)*

objectively and thoroughly what care is required, and whether a person is qualified for care under the AWBZ[3] (The Dutch national insurance for specific medical care). Everyone who is confronted with long-term and/or intensive medical care, treatment and/or guidance, along with the additional high costs, can fall back on this generic law for special medical expenses. Everyone who lives or works in the Netherlands is automatically insured for the AWBZ, and has to pay a premium for this. The Dutch Healthcare Authority[4] (NZA) is the supervisory body for all the healthcare markets in the Netherlands. The NZA supervises both healthcare providers and insurers, and determines regulations around AWBZ, including quality control, price-quality agreements, and effective investments of healthcare providers in the Netherlands. Besides the CIZ-indication, in this case, customers should be inhabitants of the city of the Hague or the surrounding districts.

Customer Relationships. A personalized, friendly, and patient attitude is required to instruct the elderly customers, sometimes with various disabilities or severe illnesses, on how the product works and what procedures (e.g., device remote control, emergency procedure) are involved.

Channels. Contact with customers directly (i.e., face-to-face) by caregivers and pharmacists, and over the phone by elderly care providers.

Key Activities. Enabling patients to take their medication independently on time, and triggering the alarm procedure whenever a customer does not take the medicine or the dispenser is not functioning.

Key Resources. There is an established alarm center available, which will be extended with and connected to the dispenser device.

[3] http://www.zorgverzekering.org/algemene-informatie/awbz/ (*dutch)*
[4] http://www.nza.nl/regelgeving/wetgeving/AWBZ/ (*dutch*)

Key Partners. See table 5.2.

Table 5.2 The stakeholders involved in this project

Stakeholder	Value creating potential
The elderly care provider	This project helps the elderly care provider to improve their homecare services (i.e., administering medicine at home), and to reduce the traveling costs of nurses and caregivers.
Business Integrator	The business integrator helps the project to deal with legal issues, ordering and implementing the dispensers, training of staff, etc. As an intermediary, they gain promotion for each leased dispenser.
Dispenser manufacturer	New customers for their lease dispensers
Pharmacist	(no changes)
Caregivers (nurses and home care)	Less waste of time for routine procedures (time that they could use for other activities, such as social event)

Cost Structure. The core costs include the purchase of dispensers and the project management costs (hourly-based contract with the business integrator), to guide and manage the care provider through legal processes and to roll out the project.

Revenue model. An intended intangible value regards the improvement of customers' independent living. In addition, the project will lead to reduction of the costs related to the caregivers' visits to customers.

Based on the described Business Model Canvas components, the highlights per component are presented in figure 5.6. The Business Model Canvas helped summarize the extensive discussions on the Business Model behind the case. Once the Business Model Canvas was developed, it helped the interviewer guide the succeeding interviews and to discuss various key aspects of Business Model. Iteratively, the Business Model Canvas has been evaluated and validated by the interviewees.

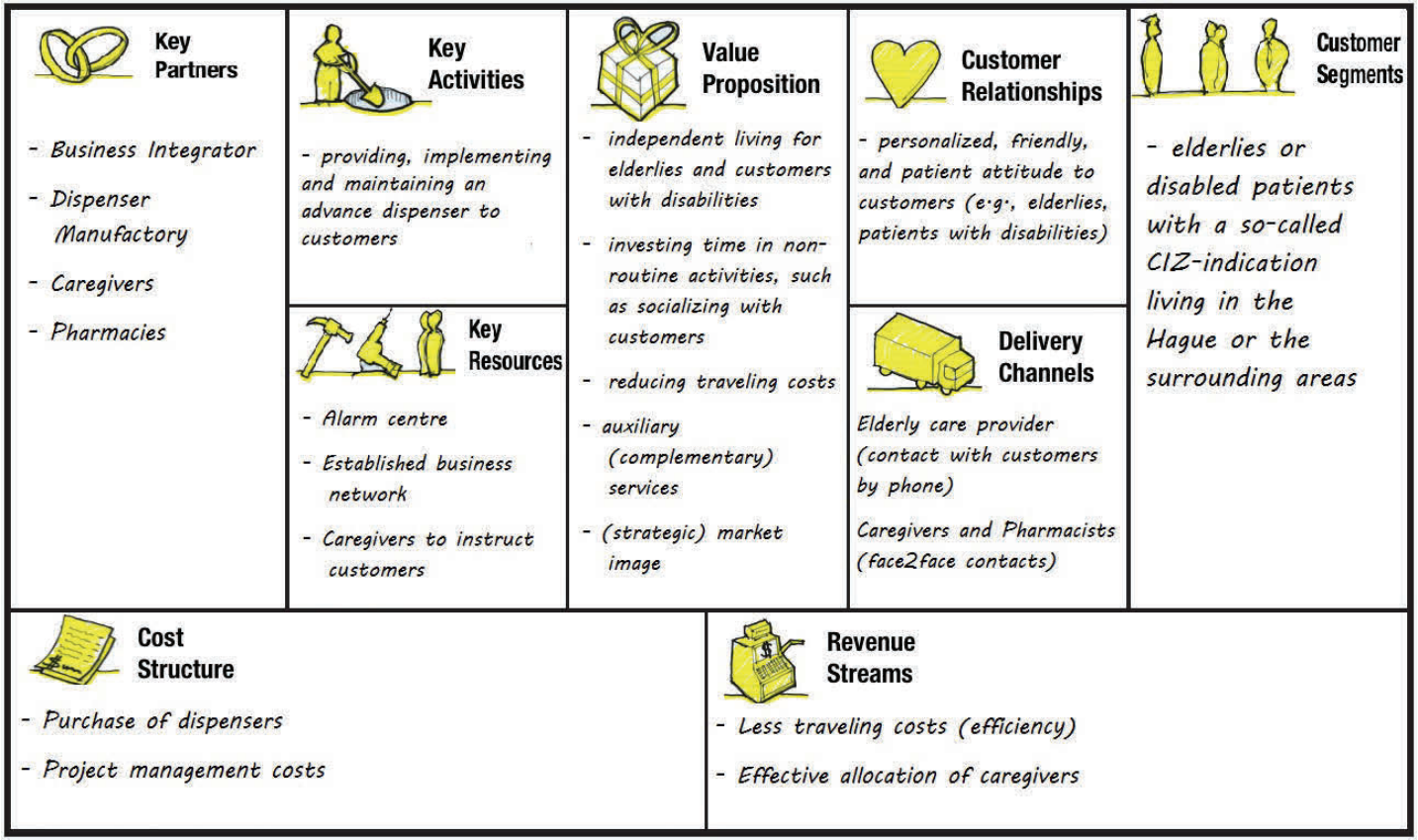


Figure 5.6 The highlights of the case Business Model (EMD)

5.2.2 A descriptive representation of the Business Model operationalization

In the same way as the previous case, the Business Model description is extended and detailed by looking into stakeholder interactions (Figure 5.7) and interdependencies (Figure 5.8) based on VIP-related questions. The interaction diagram depicts stakeholders in squares and their interactions by arrowed lines between them. The interactions relate to tangible and intangible values, data, information, knowledge and/or business processes.

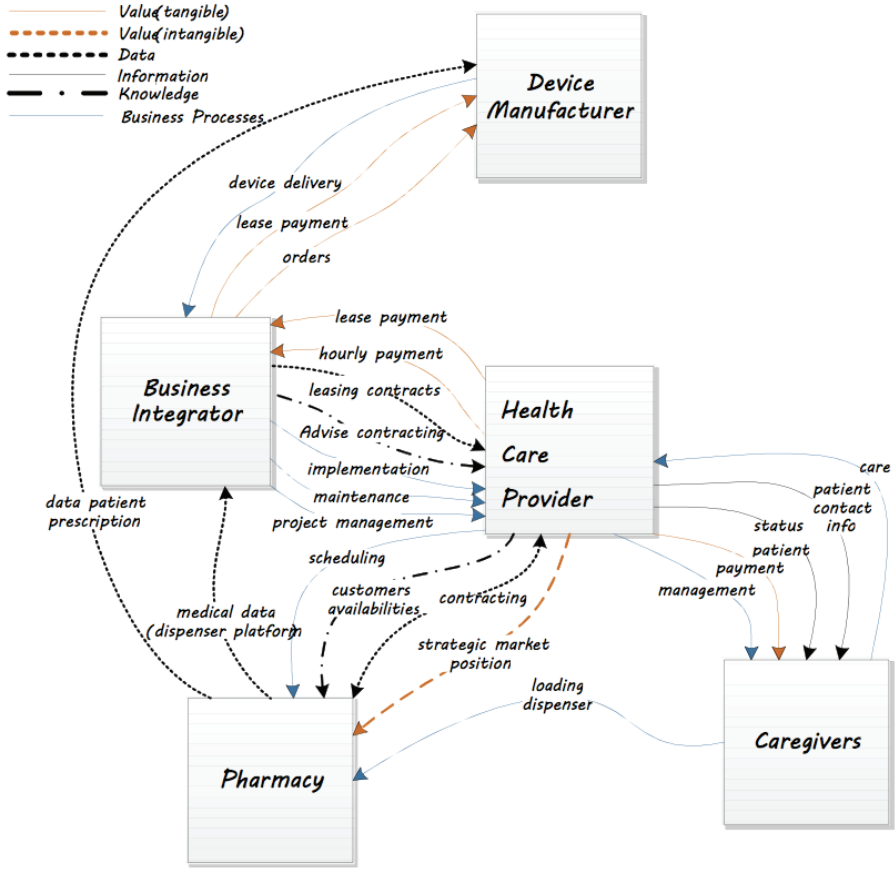


Figure 5.7 The VIP interactions diagram

The figure displays a relatively small network of stakeholders and a limited number of interactions between them. All the six VIP types of interactions

(i.e., tangible and intangible value, data, information, knowledge, business processes) exist among stakeholders. A noteworthy addition is that the interactions are dominated by operational processes between stakeholders (the blue lines), which hints at the pragmatic (or process-driven) nature of the case. In line with the Business Model discussed in the previous section, the care provider has a central role within the network and manifold links with other stakeholders, with the exception of the device manufacturer. The business integrator is the exclusive counter partner of the device manufacturer (who has a data interaction with the pharmacies patient information system), intermediating between the device manufacturer and care provider, which creates an interdependency of the care provider on business integrator. Furthermore, the diagram shows that the relationships between stakeholders are not always reciprocal. For example, in the case of the pharmacy, there is an intermediary relationship between the pharmacy and the healthcare provider.

A more detailed representation of stakeholders interactions and interdependencies is provided by figure 5.8. This figure positions the core stakeholders at the top, the multi-level objects, activities and processes within and between stakeholder in the middle, and the stakeholders business goals at the bottom. Illustrated by colors, stakeholders are associated with objects and processes, and business goals. In particular, the diagram shows how value, information and processes are interlinked. The arrows between different colors indicate the inter-organizational relations, and often, interdependencies. Many interactions (including objects, systems, and processes) can be clustered in two main responsibility areas (the dotted-line circles): device provisioning and implementing (including device maintenance) and device functioning. While some stakeholders are responsible for activities and processes across three VIP levels (e.g., the healthcare provider), some others are mainly active at one level (e.g., care givers). In addition, the flow of activities and processes, stakeholders responsibilities and interdependencies are indicated in this diagram.

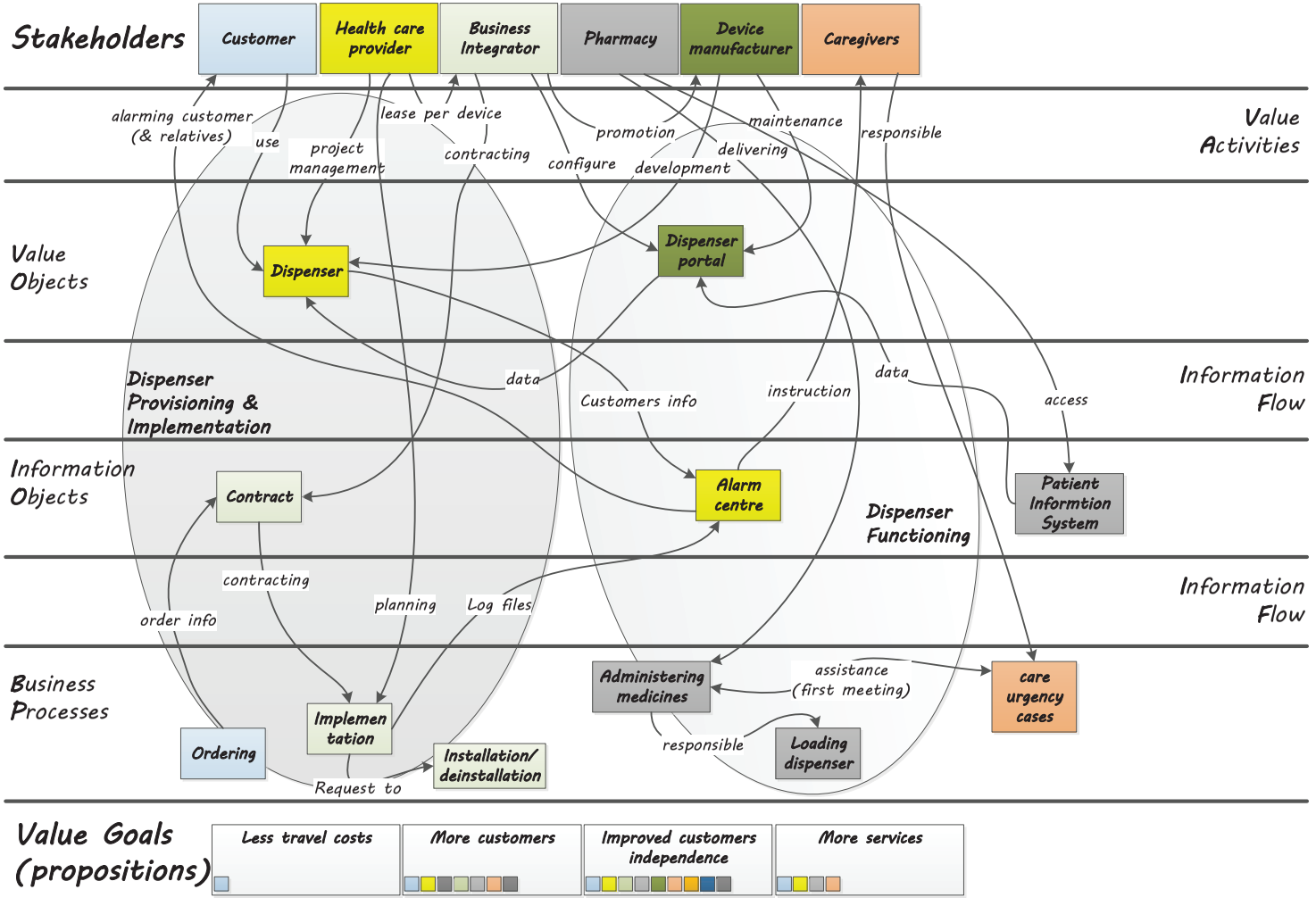


Figure 5.8 The VIP interdependencies diagram

As discussed in the previous chapter, the diagrams are developed, reviewed and validated together with the interviewees, which, in turn, has helped the interviewees (re)construct the core value propositions, value and information objects, activities and processes as well as to identify Business Model implementation issues (which will be discussed in the next section), all at various VIP levels.

5.2.3 An analytical representation of the case Business Model implementation

In the previous two sections, the case Business Model, operational processes, interactions and interdependencies between stakeholders are *described*. In this section, the case Business Model implementation is *analyzed*, i.e., identification of hindrances on three VIP levels (for more detailed discussion on analysis approach, see chapter 4, as well as interview questions appendix A).

Value creation, exchange and capturing

As indicated by one of the interviewees, there is a gap in value flow between the healthcare provider and pharmacies. According to the care provider, pharmacies will cooperate with the care provider to deliver and place medicines in dispensers, since they are obligated to do so.

> *v1. "By law the pharmacists are obligated to deliver the medicine to the patients, as delivery costs are included in the price of medicines" {DR - Director}*

The business integrator, responsible for the entire management of the project, indicates he is unaware of how negotiations with pharmacies will evolve and, moreover, managing these negotiations is beyond their responsibility.

> *v2. "The healthcare providers and pharmacies could come to an agreement on sharing the profits of project. But this is something that we rather want to stay out of. Besides, it's for us impossible to interfere in this negotiation, between care providers and thousands of pharmacies. For us, it's almost like*

shifting from B2B to B2C, with such large numbers of pharmacies." {CA – Commercial Director}

However, according to a project manager of another care provider with the same dispenser, the relationship between the healthcare provider and pharmacies is highly troublesome. According to her, the Dutch national health authority (i.e., NZA) has decided not to share/allocate profits from healthcare/elderly care projects, with/to any other organization outside the NZA network, such as pharmacies. This means that the healthcare provider is not authorized to compensate the pharmacies' additional costs. Hence, pharmacies are reluctant to participate in this project, or drop out soon after participation.

v3. "Through this project we could cut the costs when it comes to reducing the number of caregivers, and allocating the resources more effectively to areas that we considered to be more in need of caregivers aid. The project, however, fails to provide us a working solution or a convincing argument to get the pharmacies on board, after the pilot phase! They [pharmacies] incur costs in terms of additional working hours and activities, without any compensation. Their insurance [private insurance companies] is not interested to compensate the costs, as they are not gaining any value out of this project. At the same time, the NZA is not interested, as they are not responsible or even related to pharmacies and their costs. I even think that for pharmacies, this is a principle issue, which means that if care provider is earning money on this, why should we, as project enablers be excluded?… We hope to find a way to solve this bottleneck one day, but when and how is not clear yet. However, compared to fundamental problems the NZA and insurance companies have to cope with, this problem is relatively small. Therefore, getting this item on peoples agenda is a huge problem on its own." {PH – Operational Manager}

In addition, if payment to pharmacies would be regulated, the dependency of the caregiver on the pharmacy will come into existence. In case a pharmacy makes mistakes when placing the medicine in the dispenser, the care provider is responsible for rectifying the mistake and dealing with the consequences.

v4. "We [care provider] are strongly dependent to pharmacist; for example, any incorrect placing of medicine will lead to calls to us, and we need to send caregivers to the patient, to control and adjust pharmacy mistakes." {DR - Director}

v5. "We [business integrator] will take care of all possible technical problems, through an easy to use ticketing service…However, care provider remains full responsible for the dispenser." {CD – Commercial Director}

The caregiver is one of the essential stakeholders within this network, and the care provider is dependent on their willingness to cooperate. Positioning the EMD case to merely save money is not sufficient to get caregivers on board.

v6. "Caregivers are key players in this case. If they experience that using the machine really improves the care for clients and organization, and become enthusiastic, the bridge to the clients is already created…however, it remains a challenging task, because for some of them, the question may still be what is in for them" {CD – Commercial Director}

v7. "They [caregivers] are very practical, like - ' if I can do it by hand, why should I leave it to the machine!' Their presumption is that if you physically do not visit the client, you are not delivering quality services to your clients! It's not easy to convince them about machine's added value… Nevertheless, I think they are mainly concerned about the quality of care. So, if they experience improvements, they will change their mind. Besides, caregivers are not technology savvy staff, they might be frightened of new technologies." {DR - Director}

In addition, not all customers who will or can use the device should be motivated to do so. Driven by the non-profit nature of the healthcare provider, only clients who are actually in need of such a machine are eligible. In some cases, elderly and the disabled need to rely on their own abilities or improve their abilities, and avoid these kind of devices, in order to take responsibility and to maintain their independence. This view is controversial in the eyes of the business integrator and device factory, whose aim it is to increase sales.

v8. "Health quality should be the first priority, and not revenue and finance. We need to be very careful about what service should be provided to whom… Note, the more clients are dependent to the machine the more dependent they actually will be." {DR – Director}

A reliable estimation of the amount of potential users enables the project owner (i.e., the care provider) to calculate the profit/cost structure. This calculation is still missing.

v9. "Nevertheless, I need to find out if the case is financially viable… I still want to know if net cash flow will pay back our todays investments." {DR – Director}

Information creation, access, and exchange

The device and the complementary services (such as a portal) are merely valuable for specific types of clients. The commercial adviser states:

i1. "Generally, three types of clients are interested in such a service, (1) clients suffering from dementia (not in an advanced state) forgetting to take their medicine, (2) clients with somatic complaints such as rheumatism unable to open medicine pack or container, and (3) visually impaired clients who can not read the medicine information leaflet. Additionally, dispenser can be provided to new customers, as the new way of administering medicine". {CA – Commercial Advisor}

Given the specific targeted users (quotes i1, v8, and v9), the operational manager became slightly skeptical during the interview about the project's added value for their clients. Accordingly, he emphasized the need for data and information on clients characteristics to estimate the case's actual potential.

i2. "I really would like to find out, how many people could use this device. For example, one might think that - clients who are able to take their medicine- wouldn't need any device, and at the same time, if they can't do it on their own, they probably can't use the device neither!". {OM – Operational Manager}

Another issue is that of training to caregivers. According to the care provider's director, caregivers will need various demonstrations and training courses to gain the knowledge and skills needed to work with the dispenser. However, complementary to quote v7, technical training for the low-educated caregivers will be complicated and it needs to be customized to their knowledge and skills requirements.

> *i3. "The trainings and the process of learning will be complicated…the involved caregivers are not technicians, mostly not highly educated, and what's more, the device will not be in their [care givers] possession like a smart phone for their daily use!". {DR – Director}*

In short, it remains uncertain whether the caregivers will accept the new device as a useful technological support tools (quotes 6 and 7).

Primary business processes

The compatibility of existing alarm center and dispenser portal need to be evaluated and the additional costs should be calculated, as it is beyond the responsibility of business integrator. A lack of communication line between alarm center and dispenser makes it impossible for caregivers to intervene whenever customers forget or are unable to take their medicine. Even an unstable link between the alarm center and dispenser is undesirable, since it will lead to additional costs (e.g., traveling and labor costs of caregivers who need to visit customers physically at their home), which, in turn, makes the case financially unfeasible (quotes i2 and v9).

> *p1. "The dispenser is compatible with the UMO[1] standard. This is the same standard as we are using in our alarm center."{RM – Regional Manager}*

> *p2. "The connection to UMO platform and additional costs are unknown to me. The care provider needs to discuss it with the UMO platform provider...*

[1] The UMO platform is designed for alarm receiving centers to monitor a large range of telecare, telehealth, video and security devices. It provides a suite of integrated modules for offering alarm monitoring combined with call center, lone worker, GPS location, video and security services. Available at: http://www.verklizan.com/content/umo-platform/system-overview/

They [care provider] also can use our alarm center at a small additional payment."{CA – Commercial Advisor}

An evaluation of a pilot study conducted by another care provider, (using the same device, but in a different region) indicates that manageability of such a project in a larger setting is hard to predict.

p3. "Based on this pilot study, no conclusive statement or certain judgment can be provided on project manageability in the context of a full-fledged roll-out (expanding to approx. 300 clients)."(Evaluation report)

For example, it is not clear how many urgent calls can be expected and whether these calls can be received and managed simultaneously, given the existing alarm center facilities.

p4. "We can receive one call at a time, and hold the second call. We can't respond to 5 or 10 call at a time!"{ES – Emergency Center Staff}

In addition, after sales services are considered to be an important task that needs to be considered and included in agreements with business integrator and device manufacturer.

p5. "In the past we have had unsatisfactory experiences with technology provider who installed their technology but were inadequate in maintaining their technology afterward. Examples are periodic check-up/cleaning up, software update, etc. "{OM – Operational Manager}

Also the operational level collaboration between provider planning unit, caregivers, and pharmacies with regard to clients home visit, access to each other's agenda, task divisions are still unclear.

p6. "The operational level processes with pharmacies need to be considered, especially our planning with caregivers and pharmacies, and the daily collaboration between caregivers, who are our front office, and pharmacies. For example, in case a client call us to cancel an appointment with a caregiver, we need to communicate this with the right pharmacy as well." {DR – Director}

Thus far, the implementation of the case Business Model is analyzed at the three VIP levels, and several issues are identified and presented.

Also, the link between issues at various level are explained. The next section presents an overall interpretation of the identified issues and a high-level structure of issues interrelations. In addition, the impact of various case idiosyncrasies (including case complexity, stage of project, leadership, and culture) on the case analysis and findings are discussed.

5.2.4 Conclusion

Several operational problems were identified during the VIP drawing sessions and interviews. A great deal of these problems were interrelated, leading to a chain of issues that emerged at one VIP level, but initially caused at another level(s). For instance the case financial viability should be determined by calculating the total number of potential customers (v9), and that requires access to and analysis of patients profiles (i2), which, in turn, requires data-mining at the process level (p4). Also, a reversed relationship emerged, i.e., a bottom-up chain of problems. For instance, the operational manageability problem, i.e., a lack of administrative resources (p4), may impede the intended business goals at the value level (v8). In addition, problem chains within the levels were identified as well. An example is the impact of financial issues of one of the stakeholders (v3) on the case overall financial viability (v9).

Although, in this case, the value-related issues were dominant, the lower level issues were marked as equally critical to Business Model implementation. Most of the issues that were identified, on all three levels, are diverse, which makes it complicated to compare them. Although the relative number of stakeholders and their role diversity is limited, this has not led to a trouble-free case. An increase in customers is indicated as a possible source of problems, which should be attributed to a lack of resources to manage and control customer calls (p3). This problem, however, is indirectly related to the provider-centric focus of this study (i.e., networked enterprise environments). In addition, although it were not explicitly investigated, the data (e.g., the interviewees) do not indicate other case characteristics, such as the existing culture within the health sector or country, a lack of leadership skills and the prevailing leadership style, the

case in its for-profit structure, the case in its early development phase, to have an impact on Business Model implementation.

During a post-analysis interview with the project manager, he stated that the project has been terminated on the basis of the VIP analysis: "A*lthough the decision making process is ongoing, I do not except that we will continue with the Business Model as such. From the customer perspective, it would be a good service, but the analysis reveals too many risky spots on the value network and stakeholders relationship. Therefore, I am –still- happy with the VIP analysis".*

5.3 The Independent Living Project (ILP)

As indicated in the PAP case (section 5.2), Finland deals with a fast growing aging population, even faster than other EU peers and the world (Kunz, 2007). By 2030, Finland is projected to have 26% of its population over 65 years of age. This is a figure that the UK, for example, is not due to reach until 2051 (Jeavans, 2004). In Finland, the local government (i.e., the municipalities) is responsible of providing most of the public services like health and elderly care, education, social and cultural service (Laine and Maiväli, 2010). Given the increasing demand on elderly care, municipality's aim at achieving an increase in productivity and efficiency through both economies of scale (forming larger municipalities[2]) and innovations in service provision (Laine and Maiväli, 2010). As such, the project described in this chapter was funded by a municipality as well as the national funding institute for innovation, to assist the government to tackle the aging population problem, by providing innovative elderly care services in an innovative way and enhance independent living among the elderly.

5.3.1 A descriptive representation of the case Business Model

The four core elements of the Business Model according to STOF are discussed next.

Service. The Independent Living Project (ILP) is a collaborative project aimed at developing and commercializing a common healthcare services platform for the elderly. Various companies provide their services and products to elderly people through a single entry point, occasionally with intermediate actors like geriatric nurses or helpers. Providers combine and exchange their resources, among other things to increase usability (e.g., one interface instead of multiple interfaces), reduce production costs (e.g., one collective device instead of multiple devices), improve the service quality (e.g., using each others' user-related data to customize the services), and strengthen their strategic position (e.g., the consortium provides more

[2] The smaller municipalities are obliged either to merge with other municipalities or alternatively to form municipal partnership areas (joint municipal boards).

services than the individual competitors would be able to provide). Examples of services and products provided through the platform are medicine dispensers and reminders, home security; sleep quality analysis, location tracking and social video conferencing. Ultimately, in response to the aging population in Finland, the project aims to help the elderly to stay at home longer and to improve the quality of their lives through affordable healthcare services with a high-level of usability. Although the services are mainly geared towards the elderly, no other user groups are deliberately excluded.

Technology. The ILP project connects digital communication, sensor technologies and security services in people's homes to create an intelligent and integrative service/product platform, which integrates at three levels: user interface (ILP Portal), the information level (Activity and Health Record, AHR) and the device level (Home Gateway). The ILP portal, which was developed by one of the universities involved, contains the user database of different user groups, including elderly people, their families, nurses, doctors and other caregivers, administrators and others. The portal manages access rights to various services and products, and provides single-sign-on to the vendor systems involved. The user interfaces are implemented as 'portlets' on the portal, providing users with access to all the services and products on single screen. In most cases, family members or nurses who share responsibility for providing care to elderly customers access the portal. The Activity and Health Record is a key integrator of the data being collected. All device vendors have opened their server Application Programming Interfaces (APIs) to allow relevant detailed data to be stored in the shared database, for instance ILP, provided by the data integrator company. The AHR database, which can be accessed from the ILP portal, shows the current status and recent events related to the customer. Most device vendors have some kind of home-based gateway that connects their devices to the server in their data centers. Elderly people with multiple devices would end up having multiple gateways in their homes. To avoid the added cost of multiple gateways and management systems, the university involved has developed an integrated home gateway.

Organization. The ILP brings innovative companies and communities together in the field, enabling interaction between service users, providers and technology. The project's ecosystem includes service and technology companies in the area of health and well-being, public and third sector organizations. The central point in this network, which is made up of the platform providers, coordinates the project and activities, varying from fund raising and provider selection to stakeholder management and costumer contact. In all, 16 healthcare service/product providers take part in this project, a number of them only providing devices (non-integrated providers), while others provide devices that make use of the platform (integrated providers). Three departments of three different universities are responsible for developing the platform. Care providers use (or help the elderly to use) the services and an in-house call center is responsible for dealing with automated alarms (e.g., automatic alarm in case of forgotten medicine consumption) or customer questions.

Finance. The leading company in this project is the platform provider, a non-profit organization funded by the Finnish National Funding Organization, the local municipality, and three universities of applied sciences. The companies taking part in the project pay a participation fee to the platform provider. The customers pay for the service(s) they use, and the platform provider pays the service providers and the caregivers (including their call center). Integrating and centralizing the front office enables the customers to use up-dated and consistent information, with greater convenience (one-single help desk), and in a cost-efficient way (economy of scale). In case of commercialization, the university reaps the benefits in two ways. They have a share in the revenues, for instance from patents as well as intangible benefits, in terms of scientific publications and access to student projects.

5.3.2 A descriptive representation of the Business Model operationalization

Next, the Business Model is extended and specified with the help of the VIP related questions. Together with the interviewees, two different diagrams are crafted, i.e., the VIP interactions diagram (Figure 5.9) and the VIP

interdependencies (Figure 5.10). The former diagram contains the stakeholders involved and the interactions between these stakeholders. The interactions are exchanges of values (including tangibles and intangibles), information (including data and knowledge), and business processes between stakeholders. The diagram shows that the platform provider (i.e., the owner and initiator of the case) has a central position within the network, and is responsible for establishing and maintaining a close collaboration with all stakeholders. In particular, the exclusive intermediary role of the platform provider (between service providers and data integrator) enables them to have a full control over user behavior data.

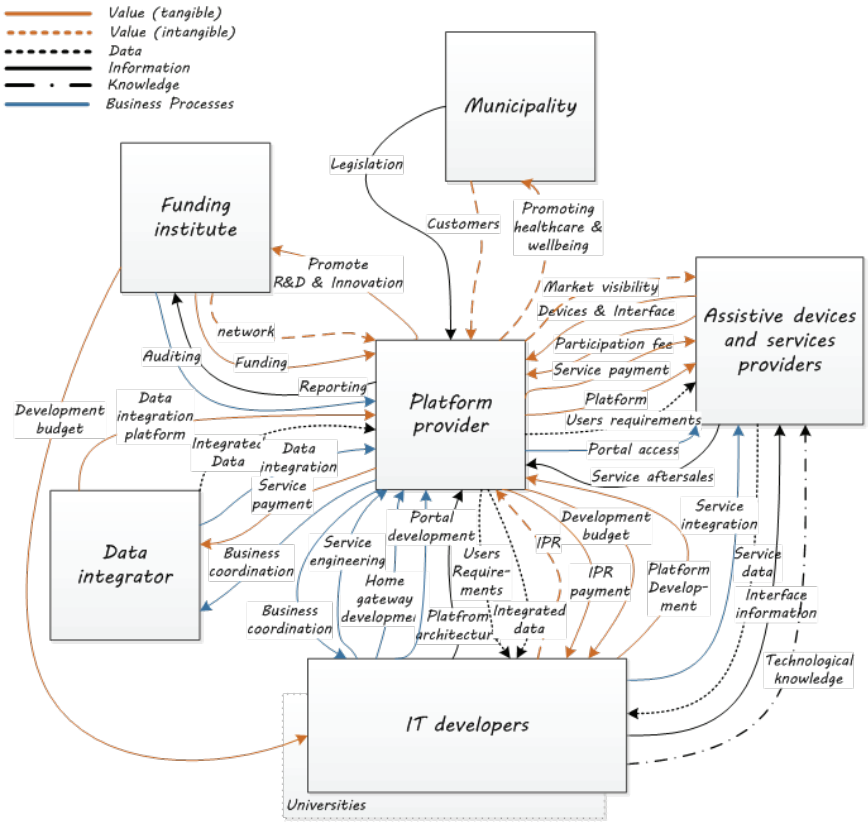


Figure 5.9 The VIP interactions diagram (ILP)

In addition, the platform provider has a similar intermediary role, as the managing and organizing entity responsible for an orchestrated teamwork,

between service providers and IT developers, especially on the system integration solutions. Both intermediary roles of the platform provider may bring along all kinds of expected and unexpected complications, from conflicting strategic interests in information access and authorization, to operational-level issues regarding (information) system integration. In a similar way as in the first case (PAP case), the diagram shows a reciprocal relationship between the interacting stakeholders.

The interdependencies diagram extends the interactions with a detailed representation of stakeholders' responsibilities, goals, and interdependencies on all the VIP levels (figure 5.10). In addition, the processes related to the core activities of the case, are grouped together (the dotted-line ovals). The diagram shows how various object, activities, and processes at one level are interrelated to those at the other levels. The diagram shows that some of the stakeholders are active at all three levels (e.g., the service and product providers), while some others come into play with a few purposes at one single level (e.g., the municipality). Furthermore, there are a few spots on the diagram (i.e., object, activities, and processes) with a central position, implying their importance (and vulnerability) in the Business Model, for instance, the process of system integration, the database, and the platform itself.

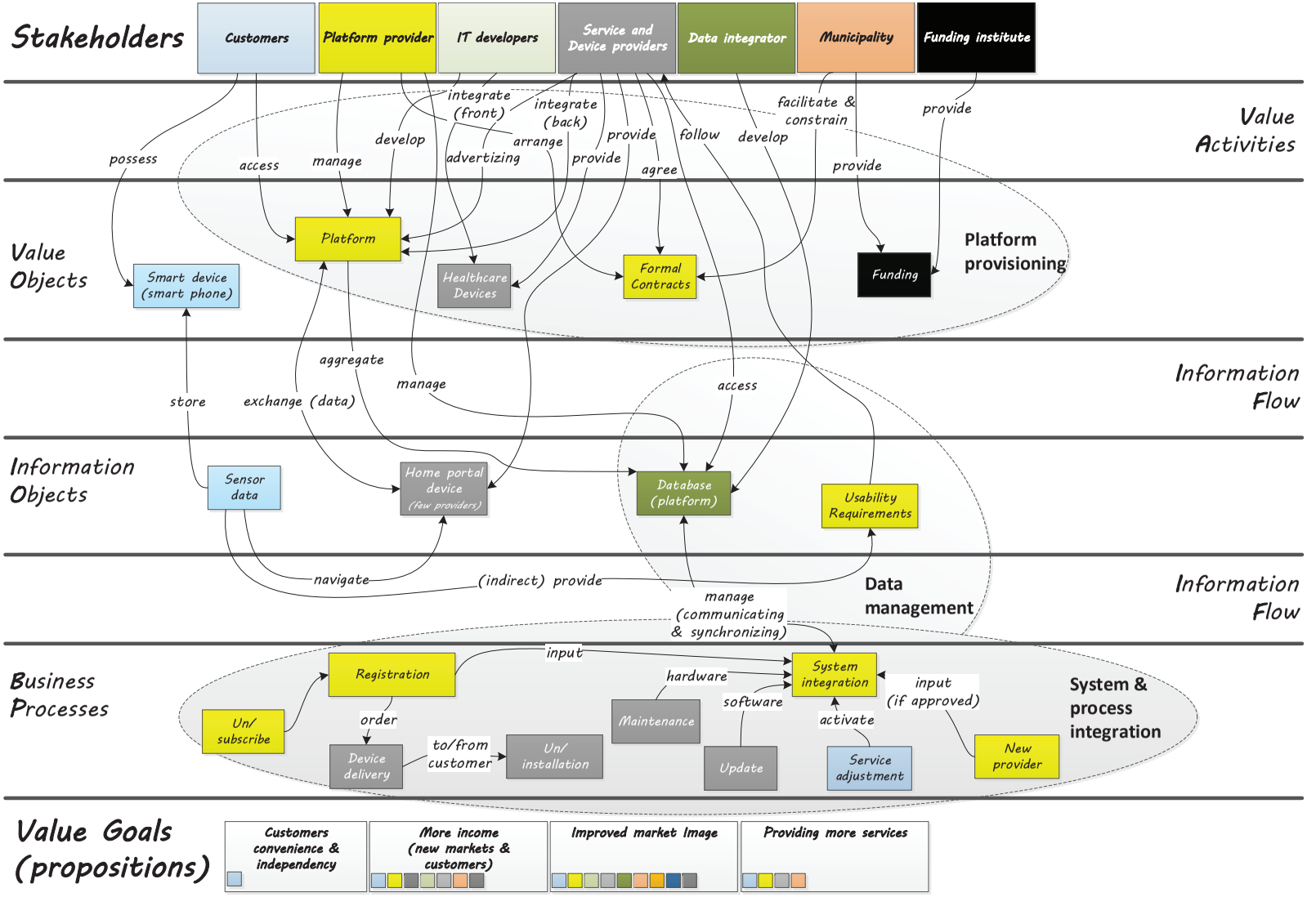


Figure 5.10 The VIP interdependencies diagram

5.3.3 An analytical representation of the case Business Model implementation

In the previous two sections, the case Business Model, operational processes, interactions and interdependencies between stakeholders are *described*. In this section, the case Business Model implementation is *analyzed*, i.e., identification of hindrances on three VIP levels (for more detailed discussion on analysis approach, see chapter 4, as well as interview questions appendix A).

Value creation, exchange and capturing

In light of the vague collective value proposition, it is hard for stakeholders to position and profile themselves within the ecosystem. As such, stakeholders have to analyze the questions around value creation and delivery, i.e., what value is created for whom? One of the interviewees found it difficult to define the Business Model, because the identification of common values seemed to be complicated:

> *v1. "Having a sustainable Business Model is about value creation, not only about the costs and what somebody is willing to pay, we need to have or create a common vision and work together! Unfortunately, it is too complex to really unravel the business objectives of the various partners….I do not know yet where the value is going to be, but I know that it will take a smart person to translate that value in an innovative way and to show who gets what value out of it." {CEO – Chief Executive Officer}*

In addition, the lack of consensus regarding common objectives makes it difficult to formulate a common value proposition, which affects the complexity of the value activities required to realize a sustainable creation and exchange of value. This for instance become apparent in decision-making with regard to 'local integrated system' versus 'remote portal solution', i.e. improvement of service usability for customers versus reduction of service costs for providers:

> *v2. "…in the short term, working on the server level (portal layer) is beneficial to providers, because they can apply changes in their services with little effort and they do not have the integration problem; however, in the*

long run, having local control (home layer) would improve usability, as one device can be used for various services or more local devices can be connected to the central device." {DM – Development Manager}

Another example involves government institutions, in this case the municipality, that focus specifically on regulation and legislation, while the commercial service providers are more benefit-driven:

v3. "An important restriction is the legislation from the municipality that prescribe how we should serve the customers. This should, of course, be part of our project and stakeholder management." {PI – The Project Initiator}

Also, competition between service providers leads to conflicting value-driven interactions, for example involving the service providers, who attempt to gain a more dominant presence on the online portal to increase their market visibility:

v4. "At the portal level, where all the providers and their services are presented, there is a ceaseless fight on who gets a bigger picture (link) and a brighter color had to be shown on the portal to the customers." {DM – Development Manager}

The relationship between municipality and the platform provider is an example of mutual value dependency (in this case monetary). In Finland, the local government (i.e., the municipalities) is responsible for public healthcare[1]. Accordingly, the municipality expects to improve public healthcare through these project, while the platform provider relies on the municipality strategic position and continuous financial support:

v5. "...local [Finnish] governments understand that they need to support us to generate the market [platform for healthcare services], as more than 60% of their budget is spent on healthcare and well-being, but in 15 years it will be over 100%!" {DIR – Director}

[1] Finland - Health system review (2008) European Observatory on Health Systems and Policies. Available at: http://www.euro.who.int/__data/assets/pdf_file/0007/80692/E91937.pdf

In a similar way, the service providers want to expand their market and service more customers, therefore, except to actually see the fulfillment of promises in their day-to-day business (in terms of increased revenues, improved performance and alike):

v6. "The technology providers are small SMEs that will gain access to new markets [through the platform] to which they would normally never have access." {DIR – Director}

Consequently, platform providers need to demonstrate their added value, governments need to support the platform providers, access to platform should lead to service delivery to new customers and increased revenues for service providers, and service providers need to provide high quality services. Otherwise, the mutual dependency between these actors will evaporate:

v7. " Convincing the service providers is not easy. They are small companies, very much sales-oriented, and if they can't see how this integration can yield a profit in the a short run, they are less motivated, and we need to convince them that this is going to benefit them in the future… and that they are not able to do this by themselves." {OM – Operational Manager}

Collaboration between service providers on the platform is highly desirable. By having access to each other resources and capabilities, they could become more innovative (i.e., offering more innovative services, improving service quality, etc.). However, in line with quotes v1 and v4 (i.e., complexity, diversity and competition), it remains a challenging endeavor:

v8. "It is not easy, but we need to set up activities that improve the commitment of different service providers, which will increase collaboration, even when it involves direct competitors." {CEO – Chief Executive Officer}

Information creation, access, and exchange

Communication between stakeholders is described as not a self-evident and self-emerging phenomenon, and it needs to be encouraged and supported. The next quote points out the significant impact that systematic communication interventions, such as weekly follow-up meetings, have on the exchange of information between stakeholders. At the same time, it

shows how difficult (inter-organizational) interventions are in a multi-actor project. Communication between stakeholders is not an obvious activity and it needs to be supported.

> *i1. "Communication is a crucial tool in weekly follow-up meetings that helps evaluate the project and to solve problems... What we have not done yet, but still need to do, is sit down with all the stakeholders and discuss everyone's requirements to be able to define and redefine the Business Model." {CEO – Chief Executive Officer}*

However, the problem of information sharing and unclear and undefined need of information is initiated from the value level. In quote v2, one of the project managers asserted that no clear strategy is determined with regard to centralized (cloud) portal, with or without local integrated or not-integrated devices. As a consequence, even with a collaborative attitude, stakeholders are unable to identify who is interested in what information, and whether and how information exchange can be realized. As such, the CEO of the data integrator company could not answer the questions on critical information objects and information flow.

> *i2. " It is a highly relevant question that we have not been considering that much. Without an overview of information assets and information processes, it's almost impossible to think about project realization. Perhaps, there is too much focus on business case in financial terms, without considering the practical issues such what do we actually want from our partners and vice versa?". {CEO – Chief Executive Officer}*

Primary Business Processes

Also on the most operational level, among stakeholders business processes, several severe hindrances can be identified. An example is the resource allocation process, which is considered to be complex, due to the fact that it is difficult for stakeholders to see the flow of resources of the other stakeholders, which means that a detailed representation of the value and resource flows is needed (inherited from value and information level interactions, quotes v1, v2, and i2).

p1. "Small companies are involved in this project, and their resources are scarce. They need to have a clear insight into the complex process of resource exchange between other actors, while carefully deciding their own resource allocation. To sustain their involvement, we really need to help them in this complex process." {CEO – Chief Executive Officer}

At the process intersection point, where various stakeholders link their processes, the (inter-organizational) operational and technical interoperability conflicts become apparent:

p2. "Right now, the providers do not need to open their boxes, they just need to adapt their interfaces and integrate them with the platform, which is why conflicts between providers processes are at a minimum… but imagine when some companies are integrated at the home-level. At a technical level, compatibility becomes a real challenge then. As a company changes its services, it has to apply these changes on the platform, which could create problems for other providers." {DM – Development Manager}

The case also shows various business process interdependencies, for example in the way the business processes of the various stakeholders are interconnected. Typically, the output of one stakeholder serves as the input for another:

p3. "On the platform, providers work together, which means that helping providers change their processes and make them compatible with the platform is an essential task for us. This is also needed because we deal with cross-actor processes that are followed by or initiate other processes." {DIR - Director}

A specific example of these interconnections involves the sales teams that need to adapt their activities to the progress of the development teams. As such, the demands of the sales teams should be in line with the supply from the development teams. One of the interviewees referred to this issue as a challenging operational dependency, where the business processes of one stakeholder need to be aligned with those of the other:

p4. "A lot of operational-level management effort is needed to organize a good collaboration between sales and developers. The commercial party

always depends on the development party. The commercial stakeholders want their services fast, cheap and with a high quality, while the developer always need more time to develop the products or services further." {EA – Enterprise Architect}

One obstacle in way of collaboration is the overlap of processes, which is partly caused by the competition on value level (quote v4). One of the interviewees recalls that overlap of business processes among stakeholders typically implies a more intense competition, probably because they provide similar or even interchangeable services. That competition will, however, continue at process level as well:

p5. "Some organizations are offering similar services, in which case we see conflicts, not only at a high-level, where these companies are competing with each other, but also at a lower level, where processes sometimes overlap." {DM – Development Manager}

5.3.4 Conclusion

In interviews and drawing sessions, several issues at all three VIP levels were identified. Mainly, these issues were interrelated, meaning that a problem on value level caused other problems on information and/or process-level. An example of such a top-down chain of problems is the process-level resource allocation complexity (p1), caused by unclear and undecided flow of value (v1,2) and information (i1) among stakeholders involved. However, in this case no bottom-up issue were identified, i.e., problems at process-level triggering other problems at the higher levels. In addition, a few within-level chains of issues existed. For instance, the conflict of interest regarding the additional integration costs that providers may need to take care of (v2) with regard to the provider's lack of resources (v7). The diversity and dissimilarity of the issues make it almost impossible to compare and prioritize them. Also, no evidence could be found to involve case number of providers or their role diversity as a possible cause of complexity. Other idiosyncrasies, including cultural characteristics (including the culture of the region where this case was conducted, the culture of the health industry in Finland, and the organizational culture), the

phase with which the case was dealing (i.e., development), and the non-profit structure of the case, were not marked as influential in Business Model implementation.

In a post-analysis interview with the platform director (the case owner), he stated that, despite the potential of the initial Business Model, he decided to resign and the project will probably cease to exist, due to a lack of in-depth analysis of Business Model implementation and obstacles to the implementation: "*I recently have handed in my resignation, and I will argue against continuation of the ILP project. I cannot say that the project was a failure, because we had a strong positive feeling and we saw a real opportunity to create something valuable for all the stakeholders….If I could go back in time and run the case again, I would hire more technical specialists to analyze the operational feasibility of our initial idea, especially the challenge of system integration and process interoperability. In my opinion, the execution of the business concept has been insufficiently investigated.*"

5.4 The Home-based Senior Care (HSC)

The ever-increasing number of aging population, caused by fertility decline and improved longevity, is and has been a genuine concern of the Chinese government (Zhong, 2011). The most recent Chinese census conducted on zero hour of November 1, 2010, shows that, of a total population of 1,370,536,875 in the 31 provinces, autonomous regions and municipalities and servicemen of the mainland of China, 177,648,705 were in the age group of 60 and over (accounting for 13.26%) and 118,831,709 persons were in the age group of 65 and over (accounting for 8.87%), while, compared with the results of the 2000 population census, the share of people in the age group of the age group of 60 and over was up by 2.93%, and that of the age group of 65 and over was up by 1.91% (Census-China, 2010). This trend will remain unchanged in the next decades. However, as the aging population is growing, the traditional, family-focused care for the elderly is deteriorating. The Chinese government recognizes the problem of fast growth health expenditures and the lack of accessible healthcare. These problem gives rise to many related topics that are at the top of the priority list of many politicians and academics, including the increase of budgetary outlay (Wang, 2004), the expansion of government-subsidized health insurance (Ramesh and Wu, 2009), income inequality (Zhong, 2011) and so on. Moreover, changes in laws and regulations have impacted the healthcare and government involvement in the past decades. Examples are the transformation of the healthcare system, changing the role of the government from that of financier to that of subsidizer (Woo *et al.*, 2002), promulgation of the Old Age Law (Zhang, 1999), and dismantling of collective farms during the 1980s (Ooi, 2005). In response to the increasing interest of politicians and scholars, several initiatives have emerged to deal with elderly care. The case described in the next sections is one of those initiatives, which is set up with a for-profit structure, but has received the attention and support of the local government.

5.4.1 A descriptive representation of the case Business Model

The four core elements of the Business Model according to STOF are discussed next.

Service. Like the previous case, the HSC case is a collaboration between a number of technology and healthcare providers, owned and coordinated by a platform provider, with the aim of improving independent living for the elderly in a city in China. In addition, similar services as discussed in the previous case are provided by the service companies involved. The basic idea of this collaboration is to develop a platform through which various technology-enabled healthcare services can be provided. As the CEO of platform put it during one of the interviews, *{the platform can be seen as a marketplace, accessible for elderly at home, from which they could select one or bundled services}*. By integrating the information flow between various service providers and customers, a rich collection of user behavior data can be generated, which can be used to further optimize the services. At the same time, the user data is a source of income, for which many companies, such as insurance firms, are willing to pay. Like the previous case, centralization improves customer convenience, reduces production costs, increases insight into customer behavior and needs and strengthens strategic market position of the participating providers. There is also a healthcare service provider involved in this case, who helps the platform provider to gain access to a large network of local customers.

Technology. Like the previous case, the HSC project aims at developing a portal-based platform to offer various care services to elderly people. However, there are a number of fundamental differences. First, this case only offers devices that enable portal-based services, which means that all the providers involved are directly connected to the central database. Next, the project involves both national and international providers (e.g., several service providers from Finland). Another difference is that the HSC uses local manufacturing for the reproduction of foreign devices, based on the design and functional requirements that are delivered by the platform provider. Finally, the university-based development teams are responsible for data integration.

Organization. Apart from four differences, the organizational structure of this project is similar to that of the previous case. First, as mentioned earlier, only integrated service providers (i.e., providers with device directly connected to the service platform) are participating. Second, in contrast to the previous case, price plays a more crucial role in China, since a silent majority of the population has relatively limited financial resources, which is why a Taiwanese device manufacturer is involved in the reproduction of devices of foreign companies, (1) to adapt the devices to the Chinese market demand/requirements (e.g., regulations, customers needs, compatibility), and (2) to reduce production costs and make them affordable for the mainly underprivileged local customers. Third, the development teams have more responsibilities, for instance, some of the development teams are steering the service providers as well as autonomy to manage the development process. There is also an IT development company involved, which supports the university, mainly with interoperability problems between the platform and the healthcare services/devices. In addition, there are as many as 33 service providers ready to collaborate and contribute to the platform. Finally, an insurance company is part of the project ecosystem.

Finance. In contrast to the previous case, HSC is a for-profit project, which is why, in addition to funds from local government, the project management team is looking for other financial resources, for example from insurance companies. The HSC platform provides the insurance company with integrated data about customer needs, wishes and behavior, which can be used to set up or improve the insurance healthcare policies and service packages. As to the project owner (i.e., the platform provider), it is indispensable to accomplish and sustain a balanced cost (e.g., costs related to technical developments, marketing, project management) and benefit ratio (e.g., providers participation fee, customers usage fee, data selling). In a similar way as in the previous case, the users will pay a small fee for the used services.

5.4.2 A descriptive representation of the Business Model operationalization

Next, the Business Model is extended and specified with the help of the VIP related questions. The collected data (i.e., interviews and written data) based on the VIP framework are visualized in two diagrams that include various types of interactions and interdependencies between stakeholders (figure 5.11 and 5.12). As discussed in the previous chapter, the diagrams were gradually shaped together with the interviewees, i.e., reviewing, adjusting and extending the diagrams iteratively, during each interview. The first diagram (figure 5.11) focuses the core stakeholders (represented by squares) and the interactions between them (the arrowed lines), including the

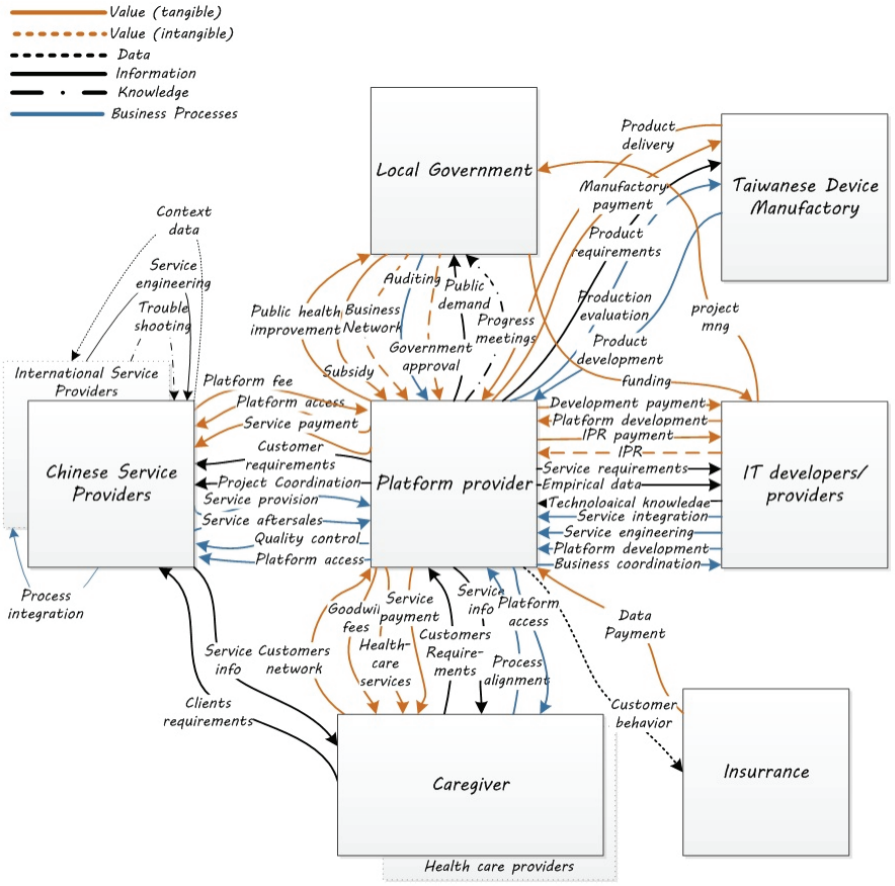


Figure 5.11 The VIP interactions diagram

exchange of (tangible and intangible) values, data, information, knowledge, as well as the inter-organizational business processes. In this diagram, the platform has a central position within the network, which hints at its major role in enabling the case Business Model. Furthermore, the diagram shows a reciprocal relationship between the interacting stakeholders.

However, there are a few interactions that are not going through the platform (for instance the interactions between local and international service providers), which, in turn, may imply possible complexities of governance and management of the processes. In comparison with the earlier cases, the diagram contains a large number of interactions, which is the result of a high number of stakeholders, combined with a wide diversity with regard to their roles. At a same time, the interactions with insurance companies is far less complicated and mainly formally contracted.

A more detailed diagram is the VIP interdependency diagram (figure 5.12). At the top of the diagram, the core stakeholders are depicted, at the bottom the stakeholders core business objectives, and in the middle the various activities, processes, and objects at the three VIP levels. This diagram elaborates on the interaction diagram (figure 5.11), and includes the *flow* (or sequence) of the core interactions, linking the three VIP levels to each other. In addition, the diagram describes the stakeholders' responsibilities (i.e., the colored activities corresponds with stakeholders color), clusters of interrelated activities and processes (the dotted-line circles). In addition to figure 11, this diagram includes customers as well, which helps explicate the link between stakeholder(s) and customers and clarify the organizations position within the network.

The diagram depicts how various objects, roles, responsibilities, and processes are divided between stakeholders, and how the output of one stakeholder is the input for the other. Broadly speaking, the diagram indicates three core responsibilities that embrace almost all the main interactions within and between stakeholders, i.e., platform development, platform management, and data management (the dotted-line circles). Some stakeholders are primarily active at the information and process level (e.g.,

universities and caregivers), while the others are mainly operating at the value level (e.g., local municipalities), or even active through all three levels, such as platform provider. Furthermore, the diagram includes a few central nodes to which several objects and activities are connected or dependent upon (e.g., the platform, the database), indicating the importance of these nodes across the network. In addition, the interactions between different color objects or processes imply the need for formal or informal inter-organizational governance.

As discussed in the previous chapter, the diagrams were developed, reviewed and validated, which has helped the interviewer (re)construct the core value propositions, value and information objects, activities and processes as well as to identify Business Model implementation issues (which will be discussed in the next section), all at various VIP levels. In the next section, the descriptive representation of interactions will be analyzed and the main hindrances to Business Model implementation will be discussed in detail.

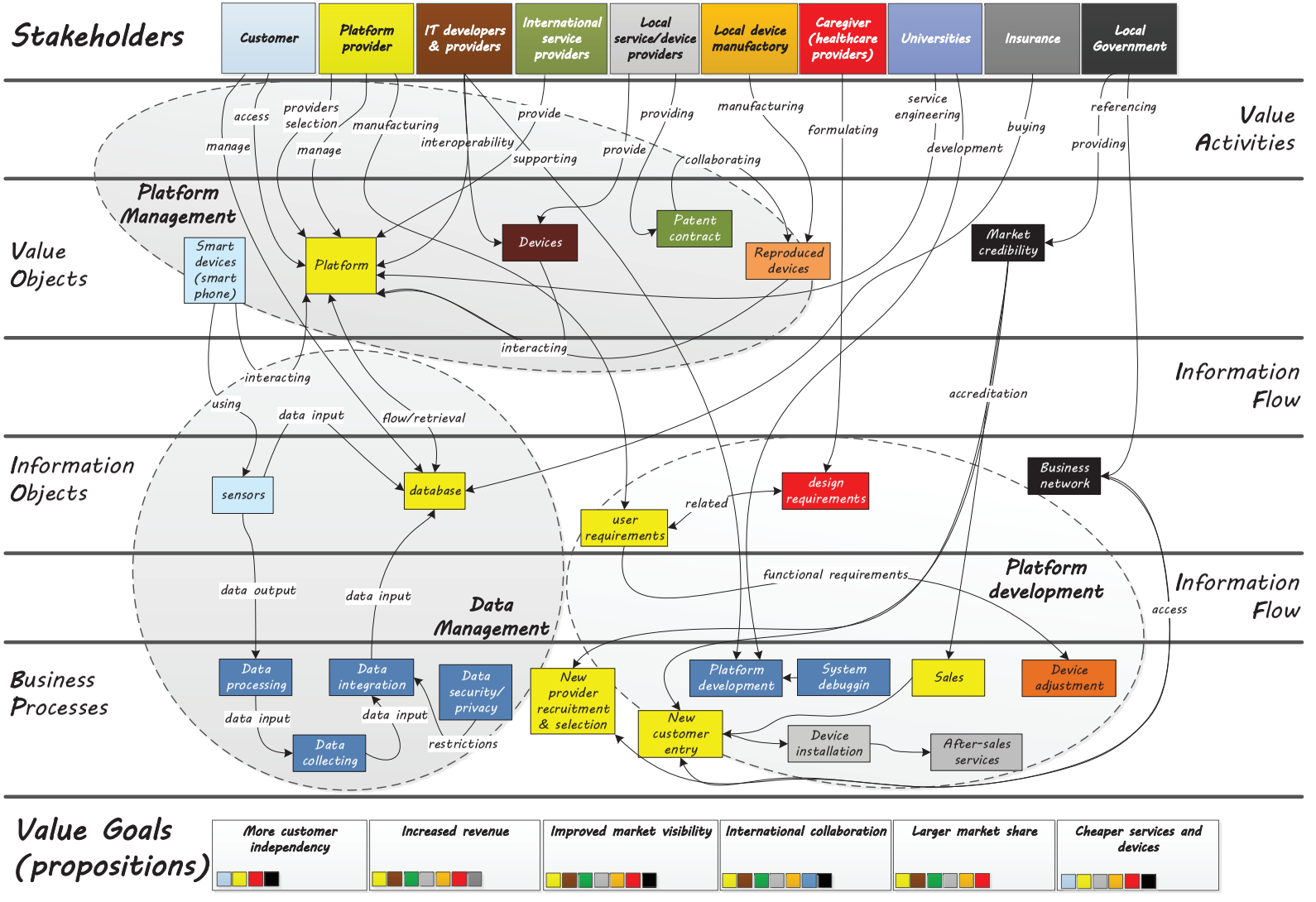


Figure 5.12 The VIP interdependencies diagram

5.4.3 An analytical representation of the case Business Model implementation

In the previous two sections, the case Business Model, operational processes, interactions and interdependencies between stakeholders are *described*. In this section, the case Business Model implementation is *analyzed*, i.e., identification of hindrances on three VIP levels (for more detailed discussion on analysis approach, see chapter four, as well as interview questions appendix A).

Value creation, exchange and capturing

The large number of actors involved in this case, combined with their diverse objectives and the changing definition of the markets they want to serve, creates uncertainty with regard to the commercialization of the Business Model. The enterprises involved are forced to continuously evaluate and compare their own Business Model to the joint Business Model. Stakeholder analysis helped one of the project managers make strategic decisions:

> *v1. "The Business Model needs to be assessed or evaluated to see whether it is going to be a success. Right now, we are not quite sure yet! …the question is whether we will help our clients and business partners, despite their number and diversity, while we are improving the care for the elderly… A challenge is how we can assess the benefits that our concept would have for our partners, for example by looking how the actors involved would operate without our company [platform provider]." {CEO – Chief Executive Officer}*

Ambiguous business strategies and objectives make it harder to deal with strategic trade-offs, e.g., the dilemma regarding short-term operational excellence versus long-term customer intimacy. For instance, the platform provider needs to keep the price as low as possible (for which they use local manufacturers to reproduce the technology in a much cheaper way), while, as far as their European counterparts are concerned, service quality has a higher priority, which leads to higher production costs. At the same time, although not outspoken, the international service providers fear for being cut off the network or subjected to intellectual property infringement (i.e.,

patent, copyright, trademark infringement), by Chinese manufactories, as soon as their technologies come into possession of these large Chinese enterprises. The problems appear as soon as financial issues, such as service pricing, are discussed:

> *v2. "The pricing of the services is difficult, since European prices will not work here [China]… the elderly here are quite poor, but the population is massive. This means prices need to be changed, which is difficult to arrange with our ILP partners, as production costs are much higher in Europe than they are here….On the other hand, the international partners are reluctant to give away their technologies for domestication and rebranding purposes, as they fear to be cannibalized by Chinese manufactories as soon as they know how to reproduce the services and products." {CEO – Chief Executive Officer}*

According to the intermediary company between the platform provider and service providers, although the stakeholders have certain common goals, there are also many apparent and hidden conflicting goals that need to be taken into account throughout the project management:

> *v3. "One of the difficulties is to balance the interests of different service providers and stimulate collaboration. All these companies have common goals, which is why they can collaborate. However, beyond these goals, there are many conflicting values. Some are willing to create value for the government, some for their own pockets, some are interested in short-term profits, others in long-term profits." {PM1 – Project Manager}*

The Chinese government needs to take concrete steps to deal with sub-optimal elderly care to keep their political promises. As a consequence, governments fund HSC type of projects; however, platform provider needs to explicate their contribution towards the realization of the strategic objectives of the funds provided by government institutes and convince the local government of the societal added value of the project:

> *v4. "The [Chinese] government needs to solve the lack of care for the elderly at a national and a local level. Without these kinds of projects [HSC project], nothing will change!" {CEO – Chief Executive Officer}*

According to the CEO of the platform provider, they need to obtain government accreditation in order to gain trust among service providers and customers alike. In response, the platform provider put lot of effort in lobbying and networking with the various local and national government institutes:

> *v5. "They [the Chinese government] help us communicate and collaborate with various business partners. Here [in China], we need the trust of our business partners to be able to collaborate with them, the way we want to collaborate, and the government is a great help in this… we can say the same about the clients. Government approval helps us enormously in gaining people's trust." {CEO – Chief Executive Officer}*

This challenge can be seen as typical intangible value interdependency, without which the platform provider will be vulnerable in Chinese competitive market.

Information creation, access, and exchange

In line with the theoretical discussion in chapter three, the interviewees in this case corroborate that the creation and exchange of information resources need a separate attention. Despite its similarity with value objects, information complexity requires a stand-alone analysis. Not only because it is an essential building block of any company, but also because it brings along a peculiar complexity, different from value-driven complexities. For instance, even though, there may be an intention to co-create value, the complexity of exchanging information or a reluctance (because of competition – quote v3) to share information will cause severe problems:

> *i1. "Despite the fact that companies are collaborating, in some cases companies do not know exactly what information to share with whom, but we [platform provider] will do everything we can to avoid this situation." {CEO – Chief Executive Officer}*

The value-information separation indicated in the last quote is not limited to identifying of information objects; it also captures information object qualities and properties. One example is the need on the part of the insurance company to have access to data on customer behavior to improve

its services. As a consequence, the platform data generation and data aggregation need to be designed and developed in such a way as to satisfy insurance companies, which, in turn, will motivate insurance companies to invest in the platform:

> *i2. "The platform stores different kinds of information, rich information, about clients' daily lives, healthcare needs, client behavior and circumstances, etc., much of which can be used for their [insurance company] policies, and we should take the needs of the insurance company into account." {CEO – Chief Executive Officer}*

Another example is the service providers' demand for the user requirements, without which it would be impossible for them to develop and provide customized services:

> *i3. "Where else can they [the international service providers] get this essential information about the users?…without these insights an effective service provisioning is almost impossible… It is challenging for us to collect the user requirements… with this information a lot can be done. For example, using them [user requirements] for service development and technical engineering." {CEO – Chief Executive Officer}*

Information sharing is another source of concern. The problem is partly inherited from value level, for instance, caused by the mismatch between service providers' business goals (quote v3). The platform provider need to put a great deal of effort in managing, encouraging and streamlining the interaction between service providers, to improve mutual commitment, trust and even friendship:

> *i4. "Trust is needed between these providers, so they can work together and share information, for example. We need to carry out lot of project management activities to create this trust and, consequently, improve information sharing." {PM1 – Project Manager}*

In addition to the high-level strategic willingness to collaborate and commitments (quote i4), the need for operational intervention to improve inter-organizational communication is emphasized, which means that, in addition to the intention to work together, the companies in question need

to consider activities designed to encourage and streamline the exchange of information:

> *i5. "How stakeholders communicate and how we [the platform provider and its intermediary partner] could facilitate this communication, to generate innovative concepts, from innovative services to improved information and business processes, will be a challenging task for us in the very near future." {PM1 – Project Manager}*

Primary business processes

Complexity occurs at the operational layer as well, and it affects the management and modeling of the stakeholders' business processes, for example their service quality evaluation processes. Part of the problems is inherited from higher level value and information activities and flow. For instance, in line with the strong complexity of cases due to number of stakeholders and their diversity (quotes v1, v3, i1), monitoring the heterogeneous processes of stakeholders is a challenging task for the platform provider:

> *p1. "To sustain our relationship with our customers, the quality of the services being provided needs to be evaluated. However, this is a very complex task, considering the fact that many actors with different backgrounds are involved." {DIR - Director}*

However, there are also several pure process-oriented issues. One of the interviewees reflected on the execution of business processes and emphasized that processes cannot be executed flawlessly, and pre/post analysis of process – together with the other stakeholders involved – is required to adjust the processes in question and solve the operational problems:

> *p2. "We need to pre-analyze the processes to prevent process frictions, but any conflicts in processes, which also will be communicated by users, through the platform provider, and then we will adjust them." {DM1 – Development Manager}*

Typically, standardization is an accepted approach to prevent conflicting informational interactions and conflicting operational business processes. In

both cases, the platform providers define a standard that addresses various features of the intended service(s), including service delivery procedures, service quality indicators, but also data/information formats and authorization. Standardization allows the platform providers to reduce informational and process-related conflicts, and to harmonize and govern the collaboration at both levels. In this regard, the interviewees underlined the need for process standardization to increase inter-organizational interoperability and reduce process conflicts:

> *p3. "Standardization of service requirements helps maximize the quality of services by increasing the process compatibility." {DM2 – Development Manager}*

> *p4. "…to prevent misunderstanding, the health provider, together with us, develops a standard that service providers can use for their service quality and service development." {DVL – Developer}*

According to one of the project managers, the process and system integration can be a highly complex task during the implementation phase, when several national and international service providers will be connected to the platform. Part of the complexity is triggered by the unknown and inconsistent interests of some service providers (quote v3), and cumbersome information sharing between stakeholders (quote i4).

> *p5. "After the pilot study we will deal with a large number of domestic and international providers with various services. Without a sustainable system integration, no service can be provided to our customers. As already discussed, even during the pilot study we have been and are facing lots of difficulties in service delivery. Especially, the link between providers systems, platform, and the healthcare systems was highly fragile. I wonder what might happen when many stakeholders, in the next phase, aim to integrate their systems. Based on my earlier experiences, a unsuccessful system integration will lead to an instable service delivery, and this in the very first phase of market introduction may destroy our market credibility and jeopardize the whole business." {PM2 – Project Manager}*

In this section, the implementation of the case Business Model is analyzed at the three VIP levels, which has resulted in identification of several issues that are expected to cause severe problems in the process of Business Model implementation. The next section presents an overall interpretation of the identified issues and patterns. In addition, the impact of various case idiosyncrasies (including case complexity, stage of project, leadership, and culture) on the case analysis are discussed.

5.4.4 Conclusion

The VIP analysis, based on interviews and drawing sessions, has resulted in identification of several operational (and operationally critical) issues at all three VIP levels. Often, these issues were interrelated, such that issues at one level were causing or caused by other issues at the other levels. For example, the conflicting interest between service providers (v3) hampers inter-organizational communication and information sharing (i4), which, in turn, complicate the stakeholders system and process integration (p4). Also, within the levels, chains of problems occurred, such as reluctance of service providers towards the exchange of information with network partners (and even impossible in some cases), due to strategic competition between them (i1), with regard to the need for information sharing between service providers (i4,5). In addition, some low-level issues may affect the higher levels goals and activities. An example is the critical integration of providers information systems with the platform on one hand, and healthcare systems on the other hand. An unstable integration dilutes service quality, which, in turn, will harm business credibility of the platform, which in the end may jeopardize the whole business (p4).

Throughout the interviews, although in generic terms, a few times the size and diversity of stakeholders involved were indicated as a factor that has engendered additional complexity, in terms of collaboration, information sharing, communication and integration (e.g., v1 and p4). In addition, from a cultural perspective, the involvement and approval of (local) government has a strong positive effect on attracting the most excellent providers in the market, and a broad range of customers. Based on the interview data, no other case idiosyncrasies (such as phase of the project, leadership, the case's

financial structure, the industrial sector to which this case belongs) could be marked as influential in the process of Business Model implementation.

In a post-analysis interview with one of the project managers of the platform providing company, he acknowledged the findings of the VIP analysis, and asserted that the analysis was used (together with a developers and health provider) to discuss the issues and arrive at an agreement on possible solutions: "*…in my opinion, the analysis is a collection of holes in our initial business concept. We found it necessary to take the analysis in the process of Business Model operationalization. The analysis however is not only about us; it involves all the actors of the network. We initially attempted to organize a workshop to discuss the issues, but we were not able to find a date to have collective meeting. Therefore, we decided to have separate session with each actor. This process will help us to evolve the concept towards a higher level of maturity.*" In another interview, with one of the intermediary managers (situated in Finland), he stated that the case has progressed since the analysis, and that they are in the middle of a larger-scale pilot study. Among others, by preserving the international providers legal position through all kinds of formal contracts between service providers and platform provider and local manufacturers (see quote v2), they were able to move a step forward. Furthermore, additional funding from Europe has helped advance the platform development and deal with system integration complexities.

In the next chapter, a cross-case analysis is provided, where the individual case findings, cross-case patterns, and case idiosyncrasies are compared.

Chapter 6. Cross-case Analysis

> *" [A]lthough a myth surrounding theory building from case studies is that the process is limited by investigators' preconceptions, in fact, just the opposite is true. This constant juxtaposition of conflicting realities tends to "unfreeze" thinking, and so the process has the potential to generate theory with less researcher bias than theory built from incremental studies or armchair, axiomatic deduction."*
>
> Eisenhardt (1989; p.546)

In the previous chapter, the VIP related questions were used to extend and detail the available descriptive Business Model of four independent cases and to identify potential Business Model implementation hindrances on value, information and process levels. The analysis includes two dimensions of network complexity (i.e., size and role diversity, see section 4.2.2) as the criteria to select the cases as well as several accidental case idiosyncrasies, which might have affected our analysis, including leadership, culture, project phase, and network openness. These case idiosyncrasies explain, to some extent, why and how certain operational issues are emerging or having a detrimental impact on Business Model implementation.

To explain and identify Business Model implementation issues, which were not fully explicable in terms of case idiosyncrasies (see section 6.1), the codes and issues from all four cases were juxtaposed and analyzed. Based on this cross-case comparison, six generic and reoccurring sources of misalignment (or factors) were revealed. From a generic perspective, these factors help understand how Business Model implementation issues are emerging, which in turn, may help avoid operational complications and enhance the operational feasibility of Business Model. Section 6.2 elaborates on these six patterns by providing a working definition for each factor, explaining how these factors can be useful in aligning the Business Model with operational

arrangements, presenting examples from case studies, and discussing the relating theoretical concepts and theories.

6.1 Cases similarities and differences

The similarities and differences between cases can be attributed to the *controlled* conditions and the *given* idiosyncrasies.

6.1.1 The controlled conditions

Following the theoretical discussion on complex system theory in section 3.5, the two dimensions of network size and diversity are used as theoretical sampling criteria to select the cases, with as result four cases with small/large size (i.e., the number of stakeholders in the network) and low/high diversity (i.e., the number of unique stakeholders roles in the network) (see section 4.2.2, figure 4.1).

By comparing the findings from the four cases, it becomes apparent that only in one case (i.e., HSC) a large network size is indicated as a troublesome aspect or a possible source of issues in future. In particular, inter-organizational communication (including information sharing between stakeholders) and system integration seem to be vulnerable in such environment. With regard to network diversity, the HSC case and PAP case (the two high diversity cases) have indicated a high network diversity as problematic, when it comes to the above-mentioned issues (i.e., communication and integration) as well as stakeholder collaboration driven by commonly intended values. Although the case studies show that the complexity created by stakeholder role diversity is more detrimental to Business Model-Business Operations alignment than network size; a low network size and/or diversity does not lead to an uncomplicated or flawless Business Model alignment and implementation. There were more conditions and factors that played a role, but were not predetermined or controlled in advance; the so-called given idiosyncrasies.

6.1.2 The given idiosyncrasies

In addition to the controlled conditions, there are several case idiosyncrasies that help explain why and how certain Business Model alignment and

implementation hindrances are emerging. For the sake of case study feasibility and manageability, these given idiosyncrasies are not embedded in the case study design (e.g., no specific interview questions were formulated on this idiosyncrasies). Nevertheless, this chapter describes these idiosyncrasies and provides several examples from the four investigated cases.

Leadership

Debate and research around leadership (and leadership styles) has a long tradition in the school of management and organization studies. While a tremendous amount of definitions are proposed by various scholars (Winston and Patterson, 2006; Bass and Bass, 2009), a broadly accepted description of leadership is provided by Stogdill (1974, p. 6-15) who conceives leadership as "*a focus of group processes, personality attribute, the art of inducing compliance, the exercise of influence, act or behavior, a form of persuasion, a power relation, an instrument of goal achievement, an effect of interaction, a differentiated role, and the initiation of structure*". Within the context of networked enterprises, managing and stimulating collaboration, communication, and sharing of resources with and between stakeholders are important parts of a leader's responsibility.

In the PAP case, doubt has been cast upon the capacity and skills of the project leader as being unable to foster trust and openness, and to encourage sustainable collaboration with the occupational healthcare provider. The leader's overprotective approach, leading to a practically closed attitude towards the partners is mentioned as an obstacle in reaching a value-level agreement, with regard to issues such as database authorization, selection of service providing partners, and the platform architecture. In the ILP case, the project leader has resigned his position due to his inability to establish a functional platform with an integrated information system. According to him, he has failed to assess and anticipate the operational complications.

Culture

Culture is another influential factor, especially in the context of networked enterprises, where multiple actors often from various geographical localities are involved (Hofstede, 1984). A host of disciplines have investigated the

impact of culture on performance (Gomez-Mejia and Palich, 1997), strategy (Hennart and Larimo, 1998), IT implementation (Cooper, 1994), organizational trust (Huff and Kelley, 2005), and network formation (Fletcher and Fang, 2006), etcetera. In addition, the presence and power of culture is palpable at various levels of analysis (Hofstede, 1983; 1991), i.e., macro level of a global culture, through national, organizational and team cultures, and down to the representation of culture at the individual level (Erez and Gati, 2004).

At a national level, the HSC case shows that, within the informal Chinese trading traditions, government support is considered a sign of quality and reliability of the supported firm and its services. For that reason, the platform provider is highly dependent on government accreditation, without which they may lose their competitive edge. At an organizational level (or sector level), according to the PAP case initiator (who manages a small, agile and innovation-driven company), the occupational healthcare provider can be characterized as a conglomerate enterprise, which is conservative, bureaucratic, and most of the time not responsive to innovation (as it is typical in the healthcare sector). The cultural differences in this case make it difficult to collectively elaborate on the Business Model at hand and to reach an agreement on several operational level issues such as data ownership and system integration issues.

Market dynamics

A business not only interacts with stakeholders (i.e., partners, suppliers, and customers), but it also affects and is affected by external forces as well. According to Porter's five forces model (1979), in addition to customers' and suppliers' power and pressure, companies need to deal with competitive rivalry, the threat of new entrants, and the threat of substitute products or services. On the other hand, business dynamics caused by an ever-changing information and communication technology, globalization, ubiquitous connectivity, convergence of industries (Prahalad and Krishnan, 2002), and complex structure of networked systems or enterprises (Sterman, 2000), disrupts the equilibrium of new emerging interconnected markets (Chakravorti, 2003). Accordingly, the importance of Business Model external

fit with changing environmental conditions is emphasized by Morris et al. (2005).

In HSC cases, an intense rivalry between service/product providers exists. Moreover, there may be value level conflicts between domestic and international service providers. While, in the developed European countries, customer intimacy and product leadership (Treacy and Wiersema, 1993) (e.g., innovative technologies and services) are generally a prerequisite for competition, in China, operational excellence (e.g., lowest price, lowest production cost, and alike) is a common approach to gaining competitive advantage. As a result, the platform provider in HSC case not only has to continuously monitor the market for providers with low-priced services, any collaboration with European providers requires an accurate financial analysis of -which in the HSC case went together with tough negotiations and irreconcilable agreements about- the costs of service delivery, manufacturing and logistics, to ensure the case financial sustainability.

Legislation

Regulations and legislation are another form of environmental forces that may impose restrictions on a business initiative. Some Business Model frameworks, such as the STOF model (Bouwman *et al.*, 2008), underline the importance of changes in legislation for the purpose of Business Model design; likewise, the analysis of Business Model implementation requires an actual and rigorous evaluation of legislation and its impact on business operations.

The study of the EMD case reveals that, among other things, the conflict between reimbursement laws of the Dutch national health authority and the policies of insurance companies hinders a sustainable continuation of cash flow between two key stakeholders (i.e., the elderly care provider and pharmacies). Among other issues, these legal/policy restrictions led to the suspension of the EMD case; however, any changes of law in future may revive the current Business Model.

Network openness

As discussed in section 3.5, along with the fast-paced technology breakthroughs in the 20th century, particularly with the rise of Information and Communication Technology (ICT) in the past four decades, industrial boundaries have evaporated and companies increasingly realize that networked collaboration is vital to survive the intense rivalry. Open Innovation (Chesbrough, 2006), networked enterprises (Bughin and Chui, 2010), and platform-mediated networks (Gawer, 2011) are some of the academic debates on networks of collaborating stakeholders. Although the concepts of collaborative networks and networked enterprises are broadly accepted, the openness of networks has remained a topic of discussion (West, 2003; Eisenmann *et al.*, 2011), to admit the participating actors without any restrictions (e.g., Android App platform), circumscribe them by rules and policies (e.g., Apple App Platform), and countless variations in-between (Barge-Gil, 2010). A crucial question in this regard is how to *govern* networked actors (De Reuver, 2009).

The extent of network openness varies in the four cases investigated in this research. For instance, the PAP case operates in a closed network with exclusive contractual agreements with its suppliers and service providers, while the HSC cases labels itself as a semi-open platform, accessible to any service and product provider that passes through the admission and selection procedure. Accordingly, whereas in the EMD case concerns were around contract accuracy and comprehensiveness to preserve legal and property rights, the HSC cared less about the contracts, literally calling it "*blah-blah formalities*" (from an interview with Chinese project manager at platform providing company), but were more concerned about platform scalability, which was expected to be required, due to its openness.

Phases of project

The literature on design science and project management prescribes various phases of design projects. Different phases of a design cycle or project focus on and deal with different types of challenges. Examples from design science literature are the multi-phased design cycles of New Service Development (NSD) (Bullinger *et al.*, 2003; Scheuing and Johnson, 1989), and the design steps proposed by Hevner et al. (2004) and Verschuren and Hartog (2005). From software development literature, the spiral model (Boehm, 1988), the unified software development model (Jacobson, 1999), and SCRUM (Schwaber and Beedle, 2002) are some examples. Also, from project management literature several staged project development and planning approaches are provided, such as PRINCE2 standard[1] and the five phases of project management proposed by the Project Management Institute, Inc. (PMI)[2].

Assuming that the business modeling process resembles or undergoes a similar design process such as, the Design Science Research methodology[3] (DSRM) proposed by Peffers et al (2007), two of the four cases in this research, i.e., PAP and EMD, just passed the ideation phase (early implementation phase), whereas the ILP and HSC were in transition to demonstration and evaluation phase (late implementation phase). Arguably, some of the operational complications emerging in these cases can be attribute to their level of maturity. For instance, a typical early implementation problem of getting stakeholders (the occupational healthcare provider in PAP case) proactively involved and committed, and the relatively large number of process integration issues in ILP and HSC cases hints at a late implementation phase.

[1] PRINCE2 is a *de facto* standard developed and used extensively by the UK government. Available at: http://www.prince-officialsite.com/

[2] PMI is the world's largest not-for-profit membership association for the project management profession. Available at: http://www.pmi.org/

[3] The DSRM contains six steps, which are: problem identification and motivation, objective definition and solution, design and development, demonstration, evaluation, and communication.

The unobserved aspects

In addition to the discussed aspects, there are several other aspects that may affect the Business Model implementation, which are neither indicated by interviewees nor observed by the interviewer in the four cases, as to cause of any VIP-related hindrances.

One aspect is the case financial structure and it is funded, e.g., for/non-profit, publically/privately held. Issues such as profit, ROI, market growth, etc., are far less prominent in non-profit socially driven initiatives, whereas in for-profit projects, cost and benefit analysis and considerations play a vital role.

The extent to which a case is dependent on or driven by technology is another dimension that may have an impact on Business Model implementation. The rapidly changing technological developments and trends not only complicate any analysis on Business Model implementation (see also the aspect of market dynamics); it also requires specific technological expertise to manage complex operational-level processes (e.g., inter-organizational information systems integrations).

The cases in this study are merely from Smart Living (health sector, some of which operate on the national market (the PAP, EMD, and ILP cases), while one (the HSC case) collaborates with stakeholders across the borders. In addition to the discussed cultural influences, several other issues related to the industrial sectors or geographical areas may have impact on the analysis of Business Model implementation. A typical example is the presence of a language barrier (e.g., miscommunication, misinterpretation or the lack of a common language/perception between different sectors or countries).

6.2 Patterns across the cases

In the previous chapter, by means of the VIP analysis, a long list of operational issues that threaten Business Model feasibility are identified and discussed (see sections 5.1.3, 5.2.3, 5.3.3, and 5.4.3). In the previous section, some of these issues are explained by the controlled conditions and several given case idiosyncrasies (see the previous sections). However, many of the issues remain unexplained. Hence, it is empirically unjustified to merely generalize from case idiosyncrasies, as (1) only a limited number of operational obstacles have been attributed to or explained by these idiosyncrasies, and (2) almost none of the case idiosyncrasies appeared in other cases. It remains challenging (if not impossible), therefore, to adopt any of these case-specific idiosyncrasies as generic recurring patterns, and valid for all four cases.

To gain an in-depth understanding of these issues, the codes, quotes, notes, and case conclusions were compared and analyzed (for more detail about data analysis method see section 4.2.4: *pattern coding*). The analysis resulted in the identification of a limited number of factors. These factors stood out as being at the core of almost all the collected operational complications and complexities (Figure 6.1). In addition to the case idiosyncrasies earlier discussed, these factors helped explain why and how the VIP operational issues are emerging. The factors are, respectively, **uncertainties** (and **contingencies**), **resource scarcity**, **hidden** (and **unknown**) **requirements**, **unilateral decisions**, **conflicting interactions**, and **incoherent interactions**.

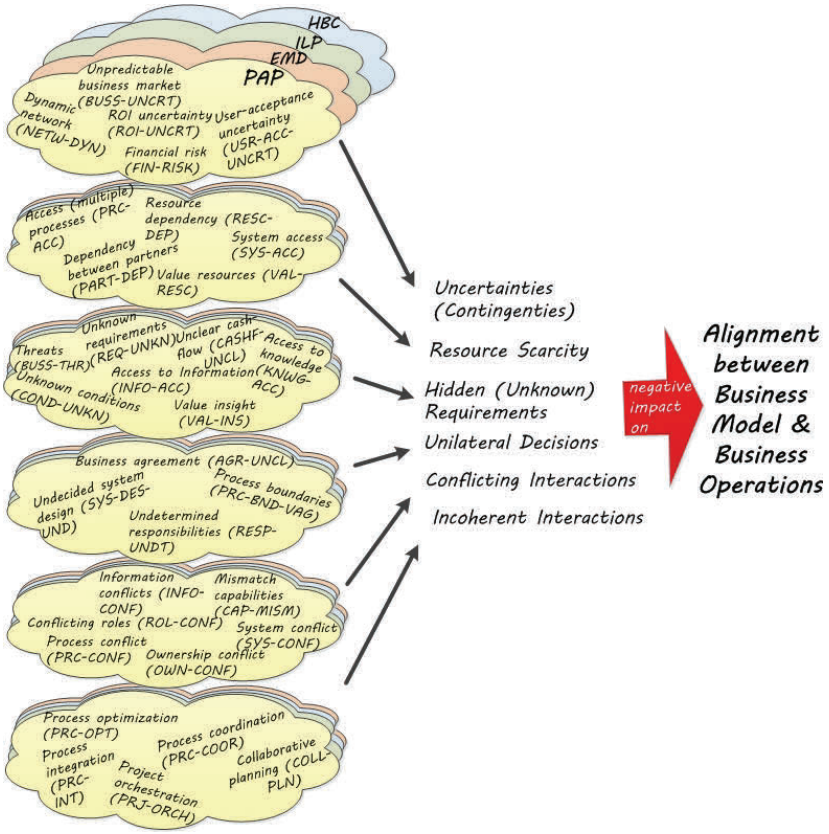


Figure 6.1 Pattern codes: the six factors influencing Business Model alignment (a detailed scheme of codes per case is provided in the appendix B)

Next, these factors, and the related disciplines and theories are discussed, examples from the four case studies are provided, and for each factor one or more propositions are formulated:

1. ***Uncertainties*** (and ***Contingencies***) are difficulties or limitations that are hard to predict due to irregular or complex interactions of situational conditions. This factor is in line with the contingency theory in organizational studies, which states that an optimal organizational structure is contingent upon several factors, including strategy, task uncertainty and technology (Donaldson, 2001). Bouwman *et al.* (2008) underline the importance of uncertainties, in terms of service/product uniqueness, cost-value balance, market dynamics and trends, as well as the strategic focus of the company (Bouwman *et al.*, 2013). Additionally,

the case study analysis in this research reveals more factors that may engender or emphasize uncertainties. As discussed in the previous section, the cultural aspects at various levels of analysis (i.e., micro, intermediate, and macro) have an impact on the viability and feasibility of a BM within different geographical areas with diverse socio-organizational cultures. Also, different Business Models require different ways of leadership; for instance, Doz and Kosonen (2009) underline the important role of leadership and propose a repertoire of leadership actions enabling the meta-capabilities needed to accelerate Business Model renewal (see also previous section for examples from the case studies). Furthermore, uncertainties may exist or arise from the operational level of the company. In a similar way as in market dynamics, an assembly of heterogeneous inter-organizational business processes may introduce all kinds of uncertain or, to put it more clearly, unpredictable interaction effects.

An example from the PAP case is: how efficient the medical doctors will be able to use the new third-party add-on (i.e., the prescription system) along with the existing systems. At the process level, any lack of system usability (e.g., ease of use, efficiency, robustness) may cause irritations on the side of the medical staff, leading to counterproductive overhead for the staff and ultimately project failure. This specific system requirement (and the future users' usage behavior, adoption and satisfaction) seemed unpredictable for several interviewees. In the HSC case, the platform provider was highly skeptical about the platform scalability and technical stability. They feared a scenario where a large number of service providers and customers willing to join (and try out) the platform, and use platform features and services at the same time. Any technical failure or instability may irreversibly damage the platform prestige and credibility within the market, particularly during the introductory phase of market roll-out.

The related propositions:

1a **Uncertainties due to multi-level socio-organizational and cultural influences impact the implementation and operational feasibility of Business Model in a negative way.**

- ***i.*** **mico-level: e.g., type of leadership**
- ***ii.*** **intermediate-level: e.g., organizational culture**
- ***iii.*** **macro-level: e.g., regional cultures**

1b **Uncertainties caused by or inherent in operational processes have a negative impact on the implementation and operational feasibility of a Business Model.**

2. ***Resource Scarcity*** denotes the unavailable (or inaccessible) assets, capabilities and processes that are required by one or more stakeholders to create value and carry out their business. From a single-firm viewpoint, resource-based theory emphasizes the relevance of resources in order to gain competitive advantage (Barney, 1991) (see chapter three for more detail). However, within the context of networked settings, the exchange of, access to, and dependencies on resources are emphasized as well. From organizational management literature, Pfeffer and Salancik (1978, p. 2) argue that "*no organization is self-contained, and the key to organizational survival is the ability to acquire and maintain resources*". According to Cook and Emerson (1978), a network consists of the interdependencies (i.e., actors, resources, and activities) between different relationships. Through their relationships, the stakeholders involved in the network can gain access to each others' resources, and therefore mobilize and use resources controlled by other stakeholders in the network (Håkansson and Snehota, 1989). The network of relationships and the inherent resource dependencies between networked stakeholders are hierarchically structured, constituted by actors with various strategic/political power, (Iansiti and Levien, 2004; Wehn de Montalvo *et al.*, 2005), in possession of resources and capabilities of varying relevance to the value creation in the network, based on resource characteristics (Ballon, 2007). This study postulates the importance of resource dependencies in networked enterprise settings,

and argues that not only the resources needed for value creation, but also the supportive resources, i.e., resources needed to *enable* value creation, particularly the operational-level infrastructure and processes, need to be aligned with the Business Model. An interesting point for further study is the issue of whether resource heterogeneity and complementarity would affect business model implementation in a positive way.

In the PAP project, pharmacists are supposed to provide patients with various kinds of information regarding physical activities. However, in the current collaborative setting, the pharmacies are not linked to the health clubs, which means that critical knowledge regarding physical activities in general, as well as data specifically related to patients, are not adequately available in pharmacies. Although pharmacies knowledge (or lack of it) of physical activities is not directly related to the prescription platform and its function; the pharmacies inability to guide customers will hamper the Business Model in the long run. In the HSC case, the platform provider needs the government accreditation in order to attract partners and customers. Within the Chinese market, particularly in Wuhan (and Hubei province), governmental support can be seen as an intangible resource that the platform provider is highly dependent on to be accepted by a broad range of customers and to leverage its business network.

The related propositions:

> *2* **Resource accessibility (or availability), including operational-level supportive resources, influences the implementation and feasibility of a Business Model in a positive way.**

3. ***Hidden*** *(and* ***Unknown) Requirements*** concern lack of understanding on the part of the stakeholders involved with regard to each other's needs, wishes, constrains, goals and intentions. Non-trivial information and requirements (including needs, demands, goals) can be unknown, latent or undocumented. In addition, some companies within a network, or staff within a company, deliberately and strategically hide information or other resources from (or are reluctant to share with) other staff members

or network partners. Hiding facts and resources or spreading disinformation are practices that are not limited to the board and management level per se, but they may also emerge at an operational level of the firm, for instance among operational level staff who are either insecure about their performance (and afraid of the consequences if a higher level manager discovers it) or exactly the opposite, when a staff member has gained a power/authority due to his/her expertise or skills, and is reluctant to lose his/her unique position by sharing or educating his/her colleagues. Either way, a lack of awareness or understanding in this area makes the decision-making process difficult, especially when companies try to formulate processes and procedures. This factor has a strong connotation with two streams of literature. Firstly, the concept of Stakeholder Analysis from Strategic Management literature, which aims at identifying stakeholders involved and eliciting their covered and uncovered strategic goals (Freeman, 1984, Mitchell *et al.*, 1997). Secondly, the concept of Requirement Engineering from System Engineering, Software Development, and Information System (IS) design, which focuses on the process of discovering, analyzing, communicating and implementing stakeholder operational needs, wishes and constraints (Nuseibeh and Easterbrook, 2000).

In the EMD case, the business integrator deliberately did not inform the elderly care provider about the discontinuation of governmental financial compensation as soon as the project passed the experimentation phase. Another example is from HSC case, where the international service providers have an implicit fear of being threatened by the Chinese manufacturers with Intellectual Property infringements as soon as the manufacturers gain access to service/product delivery/production specification. Yet another example comes from the PAP case, where the project owners did not know whether the healthcare equipment provider is able and willing to customize its systems and devices to adhere to PAP requirements, which will have a significant impact on the functional design of the PAP platform (e.g., leading to complications with regard to data collection, retrieval and analysis).

The related propositions:

3a The needs of stakeholders (i.e., partners, suppliers, and customers), ranging from business to operations, have to be made explicit in order to affect the implementation and feasibility of a Business Model in a positive way.

3b Concealed intentions of stakeholders, ranging from business to operations, impact the implementation and feasibility of a Business Mode in a negative way.

4. ***Unilateral Planning*** refers to issues that are well-known by the stakeholders, but an agreement (e.g., formal contracts), at company or network level, on how to address these issues has yet to emerge. Typically, in a networked enterprise setting, companies need to jointly deliberate, evaluate and agree upon various issues. Although less complicated, a similar process of agreement and planning is required within a company (e.g., agreement between a company's board or CFO and CIO on a IT investment). In this regard, understanding a problem is one thing (e.g., hidden requirements), but collectively agreeing on a solution, from a range of solutions, is something entirely different. Prominent within organizational science literature, the inter-organizational governance theories focus on the structure, power and process of decision-making to organize collective action (Von Tunzelmann, 2003), for example, through formal contracts (Hennart, 1993). Within the context of mobile service innovation, the importance of the government of value networks is underlined by De Reuver (2009).

   A concrete example from the ILP case is the degree of service platform openness, i.e. whether to develop a closed system for healthcare providers, a semi-open system for all stakeholders currently involved, or an open system that enables other service providers to join (e.g., see open business models, Chesbrough [2006]).

The related proposition:

> **4 Clear decisions on collaboration, ranging from business principals to operations, influence the implementation and feasibility of a Business Model in a positive way.**

5. ***Conflicting Interactions*** refer to those high-level activities or operational processes within or between stakeholders that are inconsistent with, oppose or weaken other processes, or cause value discrepancies. From a strategic viewpoint, conflicting Business Models of networked stakeholders may lead to suboptimal business moves (Chesbrough and Schwartz, 2007; Osterwalder, 2004) or conflicting value activities (Bouwman *et al.*, 2008; Gordijn *et al.*, 2003). From a business operations viewpoint, Business Process Modeling and Business Process Management, process conflicts, inconsistencies, and redundancies have been investigated extensively (e.g., Recker *et al.*, 2009; Sadiq *et al.*, 2007; Sommerville *et al.*, 1999). However, to the best of our knowledge, the impact of conflicting operational level processes on Business Model has not yet been addressed. The case studies show, however, that this link is imperative, especially in networked enterprise environments.

   For instance, in the ILP case, the threat of conflicting service providers' processes is underlined by several interviewees. Particularly as soon as the service providers are integrated at the home-level. As a consequence, any change or update on the home-level device may cause various failures at the operating platform. According to a project manager, the compatibility problem may cause the Business Model to no longer be feasible in the long run.

   The related propositions:

> **5 Conflicting business processes have a negative impact on the implementation and feasibility of a Business Model.**

6. ***Incoherent Interactions*** are high-level activities or operational processes, within or between stakeholders, which are in a state of chaos, disordered

sequence, poorly coordinated (or orchestrated) or even separate from the overall system. In the same way as conflicting interactions, the relationship between the Business Model and the management and orchestration of operational processes is has been studied insufficiently. The case studies, however, show that many obstacles to Business Model implementation are caused by an inadequate or poor business process orchestration.

In the PAP case, the orchestration of patient measurement processes appears to be poorly coordinated. The reason is that patients undergo various measurements by medical doctors, pharmacies, health clubs, and by themselves (using smart phones to register activities, nutrition, medicine consumption). However, insufficient attention is paid to a systematic approach or architecture to connect, relate and orchestrate all these measurements, which, in turn, may lead to a "*dirty database*", as it was called by the project manager (i.e., a data repository that hardly consists non-interpretable data).

The related propositions:

> ***6*** **If business processes are coherent, the implementation of Business Model will be operationally feasible.**

The identification and analysis of Business Model implementation issues is conducted by using qualitative approaches (i.e., interviews and collaborative sessions to draw VIP interactions diagrams and identify implementation hindrances). Hence, a quantitative analysis or comparison of findings of this research is neither valid nor meaningful. Yet, with a bird's-eye view on the factors and the associated quotes, it becomes clear that, despite of the varying network size and diversity of each case, all factors emerged at all three VIP levels (Table 6.2).

Table 6.2 An overview of the factors and quotes per case

PAP	Quotes
Uncertainties/Contingencies	*v1 v2 v3 v6 v9*
Resource scarcity	*i3 i7 i8*
Hidden requirements	*v4 v5 i6 p6*
Unilateral planning	*v7 v8 v10 i2 i4 i5 i9 p2 p7*
Conflicting interactions	*v6 v8 i1 i5 p2 p7*
Incoherent interactions	*v6 v5 v10 i9 p1 p2 p3 p4 p5 p6*
EMD	
Uncertainties/Contingencies	*v3 v7 v9 p3*
Resource scarcity	*i2 p4*
Hidden requirements	*i2 p2 p3*
Unilateral planning	*v9 p5*
Conflicting interactions	*v3 v5 v6 v8*
Incoherent interactions	*v3 v4 v5 v7 i3 p4 p5 p6*
ILP	
Uncertainties/Contingencies	*v1*
Resource scarcity	*v8 i2 p1*
Hidden requirements	*v1 i1 p1*
Unilateral planning	*v1 v2 v5 v7*
Conflicting interactions	*v2 v3 v4 p4 p5*
Incoherent interactions	*v8 i1 p1 p2 p3 p4*
HBC	
Uncertainties/Contingencies	*v1*
Resource scarcity	*v2 v5 i2 i3 i5*
Hidden requirements	*v1 i1 p1*
Unilateral planning	*v4 v5 i4 p3 p4*
Conflicting interactions	*v2 v3 p2 p3 p4 p5*
Incoherent interactions	*v4 i1 i2 i4 i5 p1 p2 p5*

With all the nuances involved, the factor and quotes overview table suggest that cases in the early implementation phase (i.e., PAP and EMD) were struggling with high-level value-related issues, while the other two cases in the late implementation phase (i.e., ILP and HBC), were mainly dealing with lower-level process-related complications. As it will be discussed in the next chapter, more case studies and quantitative studies are needed to assess the importance of each factor with regard to various case idiosyncrasies (e.g., a higher uncertainty-related issues in the development phase of a project) as well as the plausible correlations and causalities between the factors (e.g., the more hidden the requirements, the more incoherent the interactions are expected to be). Moreover, the next chapter provides suggestions on how to use these alignment factors and the related propositions.

Chapter 7. Discussion & Conclusions

"[O]f knowledge naught remained I did not know,
Of secrets, scarcely any, high or low;
All day and night for three score and twelve years,
I pondered, just to learn that naught I know."

(Sa'idī, 1991: Rubai'yyat of Omar Khayyām; p.125)

The aim of this chapter is to answer the research question formulated in chapter one, and discuss to what extent the research objective has been achieved. The core findings of this study are discussed in section 7.1, while the main theoretical contributions are articulated in section 7.2, and the practical implications are provided in section 7.3. The chapter concludes by presenting limitations in section 7.4 and suggesting avenues for future research in section 7.5.

7.1 Main research findings

Many studies have explored the concept of Business Model (Business Model), providing a wide variety of approaches, typologies, ontologies, definitions, etc. However, it is far from clear to scholars and practitioners which Business Model to use and how (Chesbrough, 2010; Malone *et al.*, 2006), how to bring a Business Model to the market (Teece, 2010), and how to ensure Business Model viability and feasibility (Bouwman *et al.*, 2008). All

Various parts of this chapter are submitted to Journal of the R&D Management (RDM) I would like to express my gratitude to the colleagues for their valuable feedback, Prof. dr. Jups Heikkilä and Dr. Marikka Heikkilä. Additionally, some part of this chapter is presented at the 13th Euram Annual Conference on the European Academy of Management (Istanbul, June 2013). I would like to thank the audience and session chairs (track Business Model Innovation), including Prof. Joan Enric Ricart, Dr. Patrick Spieth and Dr. Dirk Schneckenberg.

these *how-to* questions signify at least one essential quest for researchers, and that is to study and develop analytical approaches that help us understand Business Model implementation. Business Models provide a holistic view of the business logic of the creation, offering and capturing of value (Gordijn *et al.*, 2000b; Johnson 2008; Magretta 2002; Teece 2009); however, in this study, it is argued that describing a Business Model is merely a first step, and that it may not be enough to guarantee a feasible Business Model implementation. As extensively discussed in chapter three, the implementation of a Business Model is described, enabled, and most often constrained, by Business Operations, the firms' process-level activities, functions and capabilities required to run a business for the purpose of creating, offering, capturing and sustaining value for the stakeholders. As such, to understand and analyze the implementation of a Business Model, one needs to evaluate the operational business processes of the company involved, and the inter-organizational business processes of the networked stakeholders (Figure 7.1).

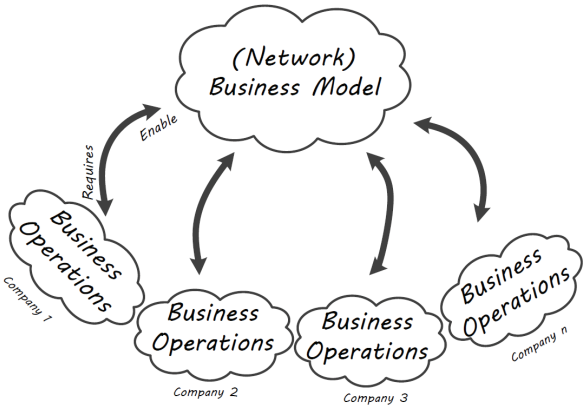


Figure 7.1 The alignment between a Business Model and Business Operations of a networked enterprise

The Smart Living sector is an example of a dynamic and multidisciplinary environment. The companies within this sector increasingly look for new ways to team up with actors from inside and outside the sector. The second chapter of this thesis provides an extensive literature overview of this sector, attempting to explore how the problem of Business Model implementation

in networked settings is addressed. Based on an extensive literature analysis, it became apparent that, despite a recent slight increase in attention to the non-technological topics (such as financial feasibility), almost no attention has been paid to Business Modeling, Business Model analysis or Business Model implementation. Instead, the sector is dominated by technology innovation and technology-driven business creators who at best consider the target markets for the technologies that they have developed, but who are often ill equipped to work on the business and market-related aspects (Valérie *et al.*, 2011). Chapter two explains that, among other reasons, being unconcerned about business modeling and Business Model implementation, deliberately or not, may cause many projects in this sector – often driven by excellent technologies - fail to reach commercialization and a large-scale market diffusion.

In response to the conceptual gap between Business Model and Business Operations, particularly within networked enterprise environments (as is typically the case in the Smart Living sector), the next research question was posed in section 1.3:

> *"How can the gap between Business Model and the underlying operational activities and processes among networked actors, within the Smart Living domain, be analyzed?"*

Answering this question should make it possible to realize the objective of this study, which is:

> *"The development and evaluation of a framework that enables the analysis of Business Model implementation, focusing on the alignment between the Business Model and Business Operations of networked enterprises, specifically in the Smart Living domain, taking into account multiple levels of analysis as well as various components of networked collaboration."*

To answer the research question, several streams of literature, including Business Model, Business Process Modeling/Management, and Enterprise/Business Architecture, were studied. In chapter three, it is argued that scholars increasingly recognize the current lack of knowledge on Business Model implementation and the gap between Business Model and

Business Operations. However, few attempts have been made - and even fewer approaches have been provided - to actually understand and analyze the gap. Having said that, several available approaches have been discussed that can potentially be used to reconcile a Business Model with the underlying business operations. With respect to the research question in this study, these approaches have at least three shortcomings, including,

- describing a firm's Business Model or business operations, instead of analyzing the gap between them,
- often with an single firm focus instead of considering the networked nature of business (i.e. eco-system), and/or,
- with a single level of analysis instead of incorporating pertinent elements of Business Model implementation (for instance merely considering value resources and interactions, while overlooking the information and/or operational processes, systems and infrastructure).

To overcome these shortcomings, chapter three integrated and synthesized various concepts, explicitly embracing the notion of multi-level processes within multi-actor settings, and proposed a generic model, i.e., the Value, Information and Processes (VIP) framework. In this chapter, it is argued that understanding the gap between Business Model and business operations requires an in-depth understanding of the creation and exchange of *value* and *information* within a company or business networks, and the way intra/inter-organizational *processes* are structured. Also, the interdependencies and dynamics within and between value-level operations, information-level operations and process-level operations need to be taken into account. Overall, the framework embodies a systematic and comprehensive composition of operational foundations required to implement the (networked) BM (Figure 7.2).

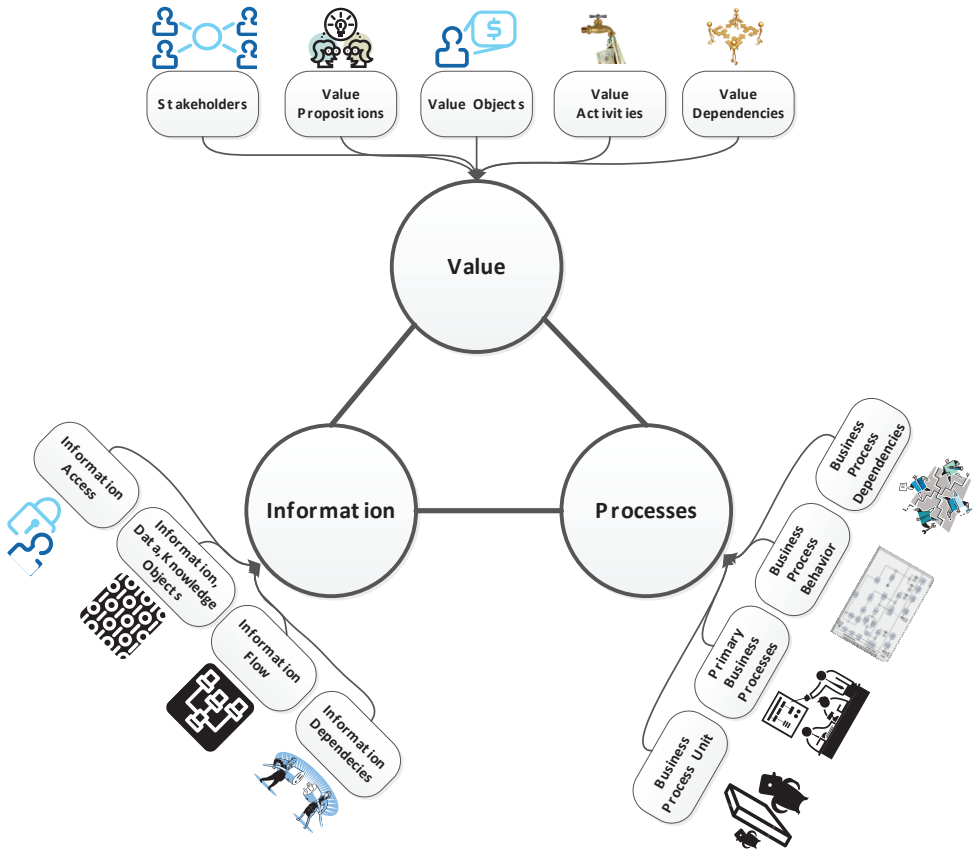


Figure 7.2 The VIP components (The VIP framework is discussed in section 3.7)

The development of the VIP framework is essential in realizing the research objective. However, the gap between Business Model and Business Operations needs to be explored and the proposed framework needs to be evaluated empirically.

Chapter four explains that the problem under examination, i.e., the gap between Business Model and Business Operations, is at an early stage of conceptualization and contextualization, for which a qualitative explorative case study is the most appropriate research method. Inspired by the complex system theory (discussed in section 3.5), it is assumed that the complexity of networked environments is a function of network *size* (i.e., the number of participating stakeholders in the network) and network *diversity*

(i.e., the number of unique roles in the network). Accordingly, for the purpose of empirical evaluation, four case studies were selected with a low-diversity/large-size, high-diversity/small-size, low-diversity/small-size, and high-diversity/large-size. However, before jumping into the 'real world', a preliminary pilot study was carried out, with the aim of improving the design and execution of the case studies (for more details on case selection criteria, research method, and case study analysis, see chapter four).

In chapter five, the four cases were described and the case study analysis and findings presented. The case study analysis shows that, even though all four cases were initiated with a promisingly potential Business Model, the VIP analysis led to the discovery of assorted "chains" of operational bottlenecks at various VIP levels. The term chain denotes a series of problems that are either caused by or have caused other problems at other levels. In a similar way, yet at a more strategic level, Casadesus-Masanell and Ricart (2011) argue that a Business Model comprises managerial "choices" with various "consequences" that influence the company's logic of value creation and value capture. As a part of the analysis, based on multiple interviews and analysis of documented resources, stakeholders were guided to draw and visualize the underlying operational structure of the case in question. This recursive process helped the subjects articulate and externalize their often tacit and undocumented knowledge in terms of concerns, doubts and questions, in a systematic fashion, starting from high-level value objects and activities and interdependencies, moving towards information access, exchange, flow and interdependencies, and concluding with primary (shared) business processes and systems and process-level interdependencies.

The cross-case analysis in chapter six sheds light on how the two controlled dimensions, i.e., the network size and diversity, have impacted the analysis. In addition, the chapter introduces several predetermined and accidental aspects, called the *given* case idiosyncrasies. Based on cross-case analysis, we posit that these idiosyncrasies affect the alignment between Business Model and Business Operations. The case idiosyncrasies include *leadership* (e.g., how an overprotective and reclusive leader may hamper the

implementation of the Business Model), *culture* (e.g., how a conservative and bureaucratic culture of a sector or company may impede a collective implementation of the Business Model), *market dynamics* (e.g., how a rapidly changing price market may undermine the Business Model), *legislation* (e.g., how conflicting reimbursement laws may render the Business Model infeasible), *network openness* (e.g., how openness of the service platform may impact the Business Model implementation), and *various phases of project* (e.g., how Business Model operational requisites change throughout the various phases of a project).

Strikingly, the case study analysis shows that the case idiosyncrasies, which include network size and stakeholders diversity, have a limited explanatory power that barely covers a minor portion of the operational obstacles that were revealed. Arguably, this is at odds with at least two streams of literature, the Transaction-Cost Economics (TCE) (e.g., Williamson, 1981) and the complex system theory (e.g., Weaver, 1948) (the latter is discussed in section 3.5). In light of TCE, it is expected that the increase in the number of participating stakeholders would lead to higher transaction costs, i.e., cost related to search and information, bargaining, and policy and enforcements (Dahlman, 1979). On the other hand, as discussed earlier (in section 3.5), a larger number of actors (or the so-called *vertices,* in network terminology) with heterogeneous properties may lead to network complexity (e.g., Newman, 2003). An alternative explanation as to why size and diversity do not happen to be severely problematic aspects with regard to alignment may be the collaborative attitude of the stakeholders involved. Although, in the platform cases (i.e., the ILP and HSC cases), there is rivalry between some service providers, in the end, they need to perpetuate the platform's value creation together, in order to realize network effects, which most likely lead to a larger market penetration and increase in revenues. This echoes Goshal and Moran's (1996) critical response to TCE, stressing that TCE does not provide an adequate account of collaborating stakeholders and their synergic alliances. Note that achieving a higher generalizability is the reason why this study explores the Business Model implementation problem within various network environments. Therefore, as discussed in chapter six many other factors that may cause complexity to emerge are not considered (see

the limitations of this study later in this chapter). For example, the complexity of stakeholders' tasks and responsibilities does not have to be directly correlated to the size of the network or the diversity of the stakeholders involved.

By further comparing, interrelating, merging and classifying the collected cross-case codes, quotes and notes, six generic factors stood out as being highly influential in relation to the alignment: *uncertainties/contingencies* (i.e., difficult decision-making process due to unknowns or unpredictables), *resource scarcity* (i.e., unavailable or inaccessible assets, capabilities and processes), *hidden requirements* (i.e., deliberately hiding - or unintentionally not sharing - resources), *unilateral decisions* (i.e., issues that are well-known among the stakeholders, but an agreement has yet to emerge), *conflicting interactions* (i.e., inconsistent activities and processes, within or between stakeholders), and *incoherent interactions* (poorly orchestrated activities and processes). Arguably, network size and stakeholder diversity are reflected in these factors, and thus, indirectly impede the alignment.

It is apparent that further evaluation and refinement of the proposed alignment framework, method and factors are necessary. Nevertheless, analyzing Business Model implementation, and understanding how its feasibility is constrained by the above-mentioned factors, appears to be an imperative step, throughout the process of Business Model innovation or design, in both large and small with homogeneous and heterogeneous stakeholders. The next two sections specify how these findings contribute to existing theories and what their practical benefits are.

7.2 Theoretical contribution

In exploring how the implementation of Business Model within networked enterprises can be analyzed, this study aims to contribute to existing Business Model literature in two ways:

1. The Business Model/Business Operations alignment framework:

This study identifies a conceptual gap between 1) a Business Model (which is, generally speaking, holistic narrative that "*describe, as a system, how the*

pieces of business fit together" [Magretta, 2002, p.91], and 2) the Business Operations (which is enabled and described by multilevel business processes, activities and systems). This study argues that the implementation of Business Models can be feasible only if a company's business operations (including its business processes, activities, systems, and infrastructure) are aligned with or supporting the Business Model. More challenging, within networked-enterprises, inter-organizational processes need to be taken into account. The importance of the relationship between Business Model and Business Operations has recently been stipulated by several scholars, e.g., Al-Debei and Avison, 2010; Bouwman *et al.*, 2008; El-Sawy and Pereira, 2013; Morris *et al.*, 2005; Teece, 2010. To the best of our knowledge, many of the available models and approaches that directly or indirectly claim to be useful for understanding and evaluating the Business Model feasibility. However, with regard to the focus of this study, these approaches have at least one of three shortcomings, in that they are *descriptive* instead of *analytical*, *single-firm oriented* instead of *networked-oriented*, and have a *single level of analysis* instead of *multiple levels of analysis* (for more detail, see section 3.6). To overcome these shortcomings, this study built upon and combined several theories, including Business Modeling (e.g., Bouwman *et al.*, 2008; Chesbrough and Rossenbloom, 2004; Gordijn *et al.*, 2000a,b; Osterwalder, 2004; Weill and Vitale, 2001), Business Process Modeling (BPMN, UML, Porter, 1985; Yu, 2001), Information Modeling and Knowledge Management (Alavi and Leidner, 2001; Bellinger, 2004; De Marco, 1979; Pfeffer and Salancik, 1987), and Enterprise/Business Architecture (Landhorst *et al.*, 2009; Versteeg and Bouwman, 2006), into an integrative framework.

2. The Business Model/Business Operations alignment factors and propositions:

Next, the gap and the framework were empirically explored within the context of networked enterprise. As discussed in the previous section, four cases were carried out, with varying degrees of network complexity. The case study analysis indicates that, regardless of network complexities, such an analysis helps us understand and explore Business Model implementation and operational feasibility within a networked

environment. The proposed approach contributes to a recent and rapidly growing stream of Business Model literature, which aims to *analyze* Business Model from various perspectives, including strategic (e.g., Zot and Amit, 2008; Teece, 2010), financial (e.g., Daas *et al.,* 2013; Tian *et al.,* 2008), and organizational (e.g., Bouwman *et al.*, 2008; Osterwalder, 2004; or the notion of Business Model internal and external fit proposed by Morris *et al.,* 2005). At a conceptual level, based on the cross-case analysis, six factors were revealed (section 6.2 provides a detailed account of the factors involved). As briefly discussed in the previous section, these factors help explain how and why operational complications emerge within networked environments. The factors that were identified call for a multidisciplinary view on alignment, involving contingency theory (e.g., Donaldson, 2001) or market dynamics (e.g., Bouwman *et al.*, 2008), resource-based theory (e.g., Barney, 1991), resource-dependency theory (e.g., Pfeffer and Salancik, 1978), stakeholder theory (e.g., Freeman, 1984), requirement engineering (e.g., Nuseibeh and Easterbrook, 2000), collective action (e.g., Von Tunzelmann, 2003), governance (e.g., De Reuver, 2009), and Business Process Management (e.g., Recker *et al.*, 2009; Sadiq *et al.,* 2007). Finally, based on these factors, several testable propositions were formulated, which help direct future studies towards a more detailed specification and operationalization of - and theory building around - alignment factors (e.g., by formulating and testing hypotheses derived from propositions) (Bacharach, 1989), for instance, a quantitative evaluation and measurement of the impact of the various factors on Business Model/Business Operations alignment, within individual or networked enterprises. Future studies involving Business Model analyses can benefit from including these factors, and performing a more specific evaluation of Business Model operational feasibility. More recommendations for future research are presented in section 7.5.

7.3 Practical implications

By definition, the high-level business objectives, as represented by Business Model ontologies, whether it is CANVAS, VISOR or any other model leaves out the operational relationships between the stakeholders involved. The

existing Business Model ontologies are mainly descriptive in nature, which means they can be valuable brainstorming tools, but they are not helpful when it comes to implementing Business Models in individual firms or networked enterprises. In a same vein, Chesbrough (2010; p.360) argues that Business Modeling tools are "*useful to explicate business models, but cannot by themselves promote experimentation and innovation with those models.*"

In all the four case studies analyzed in this research, this shortcoming was evident, as the case managers were of the opinion that they had a promising Business Model (and enthusiastically, in three out of four cases, a graphical representation of the Business Model was crafted as well); however, the managers were unsure how to implement the Business Model and they were unaware of the operational feasibility of their Business Model.

This study argues that, in the implementation of a Business Model, the devil is in the detail, and the details become clear when discussing the exchange of value and information between the potential providers and partners involved, as well as the way business processes have to be aligned. In fact, it is the lack of operational support or existence of operational constraints that foil the process of creating and capturing value, causing projects to fail, even when they are equipped with promising technologies. In particular, the message this study aims to convey is that networked enterprises, either small or large in size or with a high or low diversity of stakeholders, need to analyze their inter-organizational processes and activities and ensure that their (collective) operational arrangements are aligned with the high-level business concept represented by the (collective) Business Model (see figure 7.1). As such, any analysis of Business Model implementation requires specifications of business operations, including the existing and the required business processes and systems. Although the descriptive or pictorial power of Business Model has been underlined repeatedly so far, this study suggests that focusing merely on Business Model design and innovation is not enough. Instead, the core aspects of the Business Model needs to be tied to the underlying operational arrangement of the companies involved, taking the operational strengths and opportunities as well as challenges and constrains into account. Hence, it is necessary to understand how the

intended values, customers, channels and resources, partners, suppliers, (information) systems are actually supposed to materialize.

As depicted by figure 7.2, the proposed VIP framework may be a way to systematically extend Business Models with questions that aim to understand (1) what value-related tangible and intangible resources and capabilities are (or need to be) exchanged between which stakeholders, in what order, resulting in what value dependencies between them, (2) what information/knowledge-related assets, systems and capabilities are (or need to be) shared between the stakeholders, in what flow, through which access points, resulting in what information interdependencies, and (3) which units/teams with which primary business processes exist (or need to exist) within and among the stakeholders involved. Particularly, by sketching out the interactions or dynamics between the three levels (e.g., how process interdependencies are inherited from information and value interdependencies, or how the output of a value activity requires or is used as input for an information system or business process), a detailed understanding of Business Model implementation can be achieved. The process of alignment does not end at this point. Once a detailed representation of the core operational aspects is obtained, a shift towards an analytic approach helps evaluate Business Model feasibility. The VIP descriptions provide a comprehensive (i.e., focusing on value and information creation and exchange and business processes within and between stakeholders), yet parsimonious (i.e., focusing merely on and delineating the primary processes and activities required for Business Model implementation, instead of aiming for a fine-grained representation of all the processes and systems in question) account of business operations. In this study, the descriptions were used as a basis for iterative interviews, with the aim of identifying vulnerable, critical and potentially problematic areas that affect Business Model feasibility.

Admittedly, the process of VIP analysis may prompt a more detailed description of the operational structure of a company or network enterprise than a high-level Business Model (and less detailed with regard to business process models or enterprise architectures). Given the level of detail and the inherent complexity of analyzing the VIP representations, this approach

may conceivably be less appropriate for board level executives. Instead, it fits the responsibilities of business analysts, business architects, business innovators, business developers and the likes, who are responsible for describing, examining and implementing (innovative) business ideas and advising board level executives.

Despite the fact that *collaborative* and *collective design* has not been a part of this study (which also involves different streams of literature, e.g., Edmonds *et al.*, 1994; Kvan, 2000), the case studies shows that a joint effort of the stakeholders, i.e., using the wisdom of the selected crowd (the interviewees in this case), to map out the operational requirements and analyze the Business Model-business operation discrepancies, is the most effective way to make sure that no vital issues, which are often beyond the borders of individual companies (or the knowledge of individual actors) are overlooked. The same idea of a collective effort appears to be a highly effective way to rethink or innovate Business Model (Eppler *et al.*, 2011). Accordingly, for the purpose of data collection, in all four cases, the expertise and opinions of staff at both business and operational levels were collected, allowing the interviewees to complement or correct each other in various aspects. For example, in the HSC case, one of the first interviews was held, simultaneously, with two business managers and a developer. The interview ignited several discussions between the interviewees themselves with regard to the correctness of their responses, compelling the interviewer to adopt a moderator or mediator role, coordinating the discussion instead of raising questions.

Furthermore, the case studies revealed that, at least in the Smart Living domain, various case idiosyncrasies might have an impact on alignment (see section 6.1.2). Practically, we can infer that, in order to realize and preserve alignment between Business Model and business operations, a deliberate and proactive evaluation and supervision of alignment by leaders (i.e., the Business Model owner or implementer) is required. For example, in one of the last interviews with the case director of the ILP case, he openly admitted that his lack of insight into operational requirements was one of his most crucial shortcomings, which led a complete breakdown of the case. In addition, for companies involved in networked environments, cultural

differences at organizational, sectorial or regional levels may interfere with a harmonious interplay between Business Model and operations. The same applies to companies dealing with rapidly changing business markets and/or laws. High-tech companies, for example, operate in extremely dynamic markets, with rapidly changing trends and technologies. What works now, may not (and usually will not) remain the best way to leverage the company's operational competences. Complexities resulting from (the extent of) openness of collaborating network are another factor that should be taken into account. For instance, although a (semi) open platform concept lies at the core of the Business Model in the HSC case, the interviews made it clear that operational scalability is a point of concern. As a consequence, an unexpected increase of active users or providers on the platform would technically cause the platform to collapse. Furthermore, different project phases (e.g., design, development, implementation, commercialization) come with different needs, concerns and complexities. For example, while the PAP case (the early implementation cases) experienced difficulties in involving the core stakeholders, the ILP and HBC cases - which were further evolved in the implementation phase - were mainly stuck in process-level issues.

This study also proposes several factors that are useful in the analysis on Business Model feasibility, by identifying (1) the unpredictable operational conditions, (2) unavailable or inaccessible operational-level assets and capabilities, (3) hidden and unknown stakeholders operational needs and requirements, (4) operational decisions that were not unanimous, (5) conflicting and (6) incoherent processes at various operational levels.

Finally, although the focus of this study has been on networked environments, albeit in a speculative way, it is not expected that the process of and need for the analysis of Business Model implementation and process alignment within a *single* company will be any different. Nevertheless, the Business Model needs to be extended by adding operational details and the alignment needs to be evaluated. Similarly, this study argues that an analysis on Business Model feasibility without the VIP analysis may also lead to the discovery of operational issues. However, such an analysis remains intuitive, unstructured, ad hoc, and most likely fail to identify the

less superficial operational obstacles. Especially the chains of causalities between operational issues (i.e., the interdependencies and causalities between value, information and process levels) would be hard to identify. In addition, the proposed systematic analysis of Business Model feasibility can be used to reduce the chance of a *false positive* or *false negative* Business Model evaluation[2] error (Chesbrough, 2006, 2003; Chesbrough *et al.* 2006), by distinguishing the feasible Business Models from the infeasible ones. According to Chesbrough (2006; 2003), most often, ad hoc and intuitive analyses of Business Models fail to provide rigor and a reliable prediction with regard to their viability and feasibility.

7.4 Research limitations

This study has limitations that influence or circumscribe the interpretation of the findings.

As discussed in chapter four, to preserve the research feasibility and manageability, the number of case studies was limited to four. It is impossible to deny that a larger number of cases, from various domains, would have improved the study's external validity (Yin, 2009). However, considering the relatively short time period of a PhD research, the analysis of more than four relatively large-scale cases is hardly realizable. Nevertheless, selecting the cases based on theoretical sampling (Yin, 2009) – i.e., multiple cases with varying network complexity - the case diversity is improved, which, in turn, helps enhance external validity. Furthermore, to preserve a certain degree of homogeneity, the cases were selected from one sector (i.e., Smart Living/e-health). Case homogeneity helps minimalize all kinds of complex disturbing effects, and thus improves the internal validity of a case study analysis (Yin, 2009). The external validity is, however, limited.

[2] A "false positive" evaluation error is when an R&D project goes entirely through the process, goes to market through the company's Business Model, and fail, while a "false negative" error is when the project does not fit the company's Business Model, and is therefore not be perceived as valuable to the firm (Chesbrough *et al.*, 2006; p.12).

Other limitations may relate to the Business Model ontology that was used in the case studies. Only two Business Model frameworks (CANVAS or STOF) were used as the basis of the analysis. Perhaps using a different model or combination of models would have led to a deeper understanding of the Business Model's feasibility. However, considering the fact that the Business Models, by definition, are not meant to describe business operations, this assumption seems less likely. In fact, this PhD research started with the aim of complementing the STOF model, because the inventors have encountered difficulties to link their Business Model framework to the operational arrangement of networked enterprise (Bouwman *et al.*, 2008).

What is perhaps more significant is the lack of a control group. As discussed in the previous section, this study proposes a conceptual framework that aims at exploring the gap between a Business Model and its underlying operations. Although the proposed framework is used to explore the gap in practical settings, the framework has not been compared to other existing approaches (such as e^{3}value model [Gordijn *et al.*, 2000a] or value network analysis [Allee, 2008]), or even an analysis on an ad hoc basis, without an underpinning theoretical framework. The reason for that has to do with the objective and scope of this research. This study does not have the ambition to develop a one size fits all solution, outdoing all other existing approaches, but to *conceptualize* a model that enables the *exploration of* the gap between Business Model and business operations, specifically within the scope of networked enterprises. In other words, the aim of this study has been to develop constructs and propositions that existing literature on Business Model fails to provide. Construct may be seen as "*a broad mental configuration of a given phenomenon*" (Bacharach, 1989; p.500), while propositions state the relation among constructs, and can be defined as "*terms which, though not observational either directly or indirectly, may be applied or even defined on the basis of the observables*" (Kaplan, 1964; p.55). It is, therefore, reasonable to infer that, although the framework proposed in chapter three, the application of the framework in chapter five, and the formulated propositions in chapter six may provide a comprehensive account of the theoretical gap identified at the start of this thesis, the model

remains in need of further development, including empirical *validation*. It introduces new interesting future research topics, including evaluating the model's *expressiveness* in comparison with other available approaches (e.g., similar to the comparison of various Business Process Modeling approaches provided by Van der Aalst *et al.*, 2003).

Another approach to such a validation is measuring the VIP impact. Due to the PhD research time limitations, the actual effect of the VIP analysis on Business Model implementation has not been evaluated. That would require a longitudinal research approach (e.g., longitudinal case study, Aaboen *et al.*, 2012), to determine whether the reconfigured Business Model (based on the VIP analysis) would actually lead to a successful Business Model implementation (i.e., actually create, provide and capture value). The study, however, includes several post-hoc interviews with cases project managers, to hear the subjects' opinions about the VIP analysis and how the case managers employed the findings of the VIP analysis.

Furthermore, in this study, an inductive data analysis, as proposed by Miles and Huberman (1994) was applied. The analysis echoes the Grounded Theory (GT) research processes proposed by Glaser and Strauss (1990). Alternatively, other inductive methods of GT can be used to explore, collect and analyse data. For instance, instead of starting by specifying the *problem,* as was done in this study, one can study a range of individual cases and extrapolate the results to form a conceptual category (Charmaz, 2006), or conduct a longitudinal case study, to evaluate the impact of the VIP analysis on Business Model over a certain time span.

Finally, given the lack of empirical studies and useful theories with regard to the gap between Business Model/Business Operations, a qualitative explorative case study is thought to be the most suitable method (see chapter four for more detail). As suggested by many scholars (e.g., Denzin, 1978), combining different methods help enhance the validity of the results and to increase confidence in the interpretation. More specifically, from case data it is hard to conclude which of the extracted factors (and relationships) are the most important, and which are simply idiosyncratic to the cases examined in this study (Eisenhardt, 1989).

A detailed discussion on promising directions for future research is provided in the next section.

7.5 Recommendations for future research

This study can be viewed as a basis for or introduction to analyzing Business Model feasibility within networked enterprise settings. As the concept of Business Model is increasingly applied in networked environments (e.g., open innovation and open Business Model [Chesbrough, 2012]; Business Model dynamics [El-Sawy and Pereira, 2013; Cavalcante *et al.*, 2011]; collaborative Business Models [Chen and Cheng, 2010]; Business Models in value networks [Bouwman *et al.*, 2008; Valérie *et al.*, 2011]), it is interesting to elaborate on this study in several ways.

In the previous section, several limitations have been outlined. These limitations can be seen as valuable input for future studies. One area has to do with the generalizability of the VIP framework and analysis. Replicating this research in various other domains or sectors, for instance Internet-based businesses may generate a broader understanding of the conceptual gap. The domain of Internet-based businesses includes a large number of SME's and enterprises that need to compete and collaborate within an extremely dynamic (often technology-driven) market. Exploring how this dynamic ecosystem affects the Business Model implementation and whether and how the VIP responds to such an environment will enhance the model's generalizability. The analysis can also be repeated under various conditions and idiosyncrasies, including specific countries, cultures, innovation phases, and business environments (e.g., IT-driven, public, non-profit, etc.).

Furthermore, the VIP generalizability can be improved by comparing the model's various qualities (e.g., applicability, effectiveness, comprehensiveness, comprehensibility, expressiveness, etc.) with those of other approaches (e.g., e^{3}value model [Gordijn *et al.*, 2000a,b], value network analysis [Allee, 2008], or strategy activity system [Porter, 1996]). An example is the conceptual comparison of the Canvas model and e^{3}value ontology that have been compared by Gordijn *et al.* (2005). Such a comparison can also be performed in a comparative experimental setting (Bailey, 2008; Montgomery

and Montgomery, 1984), where one or more groups are subjected to use and assess various the modeling tools qualities and limitations. In the business process modeling literature representational comparison and analysis of modeling techniques is a common approach (e.g., Recker *et al.*, 2009, Green *et al.*, 2005, Keen and Lakos, 1996). Also, as discussed in the previous section, the *process* of VIP analysis can be evaluated through longitudinal case studies (Aaboen *et al.*, 2012). This means that the feasibility of a given Business Model is analyzed, the findings of the analysis are then used to reconfigure the Business Model and business operations, and finally, the actual implementation of the reconfigured Business Model and business operations are qualitatively evaluated and/or quantitatively measured.

Measuring the effectiveness of Business Model implementation opens a new door to the literature on Business Models. Combined with the area of Performance Measurement (e.g., Folan and Browne, 2005; Neely et al., 1995), the VIP analysis and its impact can be quantified. Neely et al. (1995, p.4) define Performance Measurement (PM) as the "*process of quantifying the efficiency and effectiveness of action, a performance measure as a metric used to quantify the efficiency and/or effectiveness of an action, and a performance measurement system as the set of metrics used to quantify both the efficiency and effectiveness of actions*". According to Shane (1997), PM is not only an ongoing process designed to provide a balanced, methodical approach to assessing an organization's performance, but it is also used to provide feedback at all levels - strategic, tactical and operational - on how strategies and plans are realized. By combining different measures (including measures related to value and the creation and exchange of information and operational processes), based on the available metrics and the development of new ones, the effects and impacts can be measured more accurately.

Based on case study findings, chapter six identifies and discusses six distinct factors that affect the alignment between Business Model and Business Operations. On the basis of these factors, several testable propositions were formulated (see section 6.2). A quantitative validation (and also qualitative) can help refine and validate these factors and measure correlations and causalities between them (e.g., by using advanced statistical methods like as

structural equation modeling), as well as developing explanatory models to further clarify how these factors influence Business Model feasibility.

Furthermore, the multi-layered understanding of Business Models and the operational issues may create increased but unwanted complexity, which means that entrepreneurs and researchers are faced with a trade-off between understanding details and adding to complexity. Future research can help improve the VIP modeling method proposed in this research by further optimizing or simplifying the graphical representation of the VIP components, for instance in a modular approach, or by applying a single-view approach (i.e., looking at the inter-organizational VIP interactions and processes, but this time from the point of view of a single stakeholder).

Finally, the application of the VIP approach can at least be related to two well-established disciplines, i.e., Stakeholder Analysis and Management (Donaldson and Preston, 1995; Freeman, 1984; Preston and Sapienza, 1990) and Business/Enterprise Architecture (Lankhorst *et al.,* 2009; Versteeg and Bouwman, 2006; Zachman, 1997). While the former aims at understanding a network by identifying its key actors or stakeholders and assessing their respective interests in the system in question (Grimble and Wellard, 1997), the latter aims at providing an enterprise blueprint from various perspectives, including business, operations and functions (Versteeg and Bouwman, 2006). Stakeholder techniques focus mainly on a high-level analysis of stakeholders, which can be enriched with the operational perspective that the VIP framework aims to provide, while the descriptive nature of architectural approaches can be extended with the analytical models, for instance the VIP framework.

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Appendices

Appendix A: Interview Questions

First, the interviewees were inquired for their position, background and relation to the case:

Q1. Background

What is the background of the interviewee, company (s)he is working for, and his/her role and responsibilities, within the case?

Inspired by STOF and Canvas frameworks, insights regarding Business Model generic components are collected (including case value propositions, technologies, key resources, intended services, relationships with suppliers and customers, finance).

Q2. Business Model

a. *What the project mission and vision?*
   In terms of (intended) value proposition, technologies (to be) used, services (to be) provided, relationships with partners and customers, needed/available key resources.

b. *Who are the stakeholders and what are their roles?*
   In terms of contributions, responsibilities, contracts, etc.

c. *What is the structure of the case costs and benefits?*
   In terms of payments, revenues, ROI, etc.

The third set of questions aimed at extending the high-level Business Model with the operational interactions within and between stakeholders. Following the VIP framework, three types of questions, respectively focusing on value, information creation and exchange, and the primary business processes (especially the inter-organizational processes), were formulated:

Q3. Operational arrangement

3.1 Value creation & exchange:

a. *What values are (should be) created and exchanged between, and captured from stakeholders?*
   Referring to the core value objects and value goals that are required to drive the project towards the high-level missions and visions discussed in Q2.

b. *How are (will) the values (be) created, exchanged and captured?*
   Referring to the core value activities required for creation and capturing of values, and value dependencies (between stakeholders) created through exchange (or need) of value objects.

3.2 Information creation & exchange:

a. *What information (resources) is (should be) created and exchanged between stakeholders?*
   Referring to the core data, information and knowledge objects required for the value activities discussed in Q3.2

b. *How are the information (including data and knowledge) objects created and exchanged between stakeholders?*
   Referring to the crucial information flows, information access (points and permissions), and information dependencies between information objects in the previous question.

3.3 Primary Business Processes:

a. *What are the primary business processes (will be) shared among stakeholders?*
   Referring to business processes required to enable the value and information activities discussed in Q3.2 & Q3.2.

b. *How are these business processes flow between stakeholders?*
   Referring to the flow, behavior, and boundaries of, and dependencies between business processes discussed in the previous question.

The interviewees thoughts and experiences on problematic, critical, complex, vulnerable interactions value, information and business process discussed in Q3, were collected:

Q4. Problematic interactions

a. *What values and values activities (creation, exchange, capturing) are the most critical, vulnerable, complex, or problematic? And how to deal with them?*
b. *What information resources and information activities (creation, exchange) are the most critical, vulnerable, complex, or problematic? And how to deal with them?*
c. *What primary business processes are the most critical, vulnerable, complex, or problematic? And how to deal with them?*
d. *What effect does the number of stakeholders involved and the diversity of their roles (may) have on problems identified in Q4.a, b and c?*

Finally, the impact of the VIP analysis on the case progress and the case Business Model is evaluated.

Q5. The impact of the VIP analysis

a. *How is the VIP analysis used in the course of the case and what impact did the analysis have on the Business Model implementation?*

Appendix B: Categorized codes

Case 1: Physical Activity Prescription (PAP)

Factors	Codes	
Uncertainties (Contingencies)	user-acceptance uncertainty	USR-ACC-UNCRT
	unpredictable business market	BUSS-UNCRT
	ROI uncertainty	ROI-UNCRT
	financial risks	FIN-RISK
	network dynamics†	NETW-DYN
Resource Scarcity	Access to (multiple) processes*	PRC-ACC
	resource dependency†	RESC-DEP
	dependency between partners†	PART-DEP
	value resources*	VAL-RESC
	system access*	SYS-ACC
Hidden (Unknown) Requirements	unclear cash-flow	CASHF-UNCL
	unknown requirements	REQ-UNKN
	unknown conditions	COND-UNKN
	value insight	VAL-INS
	Access to information*	INFO-ACC
	Access to knowledge*	KNWG-ACC
	(business) threats	BUSS-THR
Unilateral Decisions	undecided system design	SYS-DESG-UND
	unclear (business) agreement	AGR-UNCL
	vague process boundaries	PRC-BND-VAG
	undetermined responsibilities	RESP-UNDT
Conflicting Interactions	mismatch capabilities	CAP-MISM
	ownership conflict	OWN-CONF
	information conflict	INFO-CONF
	system conflict	SYS-CONF
	conflicting roles	ROL-CONF
	process conflict	PRC-CONF
Incoherent Interactions	processes coordination*	PRC-COOR
	processes optimization*	PRC-OPT
	process integration*	PRC-INT
	project orchestration*	PRJ-ORCH
	collaborative planning*	COLLB-PLN

* Lacking or required
† Critical, complex or troublesome

Case 2: Electronic Medicine Dispenser (EMD)

Factors	Codes	
Uncertainties (Contingencies)	value uncertainty	VAL-UNC
	ROI uncertainty	ROI-UNC
Resource Scarcity	process dependency†	PRC-DEP
	capability dependency†	CAP-DEP
Hidden (Unknown) Requirements	unclear cash-flow	CASHF-UNCL
	unclear agreement	AGR-UNCL
	hidden information	INFO-HID
	unknown market share	SHR-UNKN
	unknown business requirements	BUSS-REQ-UNKN
	hidden negative experience	NEG-EXP-HID
Unilateral Decisions	undecided agreement	UND-AGR
Conflicting Interactions	value conflict	VAL-CONF
	process conflict	PRC-CONF
	responsibility conflict	RESP-CONF
	attitude conflict	ATT-CONF
	undesirable dependencies	UNDS-DEP
Incoherent Interactions	process integration*	PRC-INT
	process coordination*	PRC-COOR
	training coordination*	TRN-COOR
	process orchestration*	PRC-ORCH
	system scalability*	SYS-SCALA
	collaborative planning*	COLLB-PLN

* Lacking or required
† Critical, complex or troublesome

Case 3: Independent Living Project (ILP)

Factors	Codes	
Uncertainties (Contingencies)	uncertain value propositions	VAL-PROP-UNCRT
	uncertain profitability	PROF-UNCRT
Resource Scarcity	resource dependencies†	RESC-DEP
	capabilities dependencies†	CAP-DEP
	access to market*	MAR-ACC
	financial resources*	FIN-RESC
Hidden (Unknown) Requirements	unknown business requirements	BUSS-REQ-UNKN
	unknown design requirements	DESG-REQ-UNKN
	unclear value propositions	VAL-PROP-UNCL
Unilateral Decisions	undecided system design	SYS-DESG-UND
	legal boundaries†	LEG-BND
Conflicting Interactions	common vision*	VSN-CMN
	design trade-offs†	DESG-TRD-OFF
	conflicting interests	INTRS-CONF
	consensus on the intended value*	INTD-VAL-CONS
	process conflict	PRC-CONF
Incoherent Interactions	collective effort*	COLLC-EFF
	inter-organizational communication†	INTORG-COM*
	information asset management*	INF-MNG
	information process (flow) orchestration†	INF-ORCH
	resource allocation†	RESC-ALLC
	inter-organizational coordination*	INTORG-COOR

* Lacking or required
† Critical, complex or troublesome

Case 4: Home-based Senior Care (HSC)

Factors	Codes	
Uncertainties (Contingencies)	uncertain value proposition realization	VAL-PROP-REAL-UNCRT
Resource Scarcity	resource dependencies*	RESC-DEP
	governmental accreditation*	GOV-ACCRDT
	data dependency*	DATA-DEP
Hidden (Unknown) Requirements	fear of intellectual property infringement	IP-INFR-FEAR
	unknown (business) information needs	INFO-REQ-UNKN
	data requirement*	DATA-REQ
	unknown (user) data	DATA-UNKN
Unilateral Decisions	service quality agreement*	SERV-QUAL-AGR
	standardization*	STND
Conflicting Interactions	pricing conflict	PRIC-CONF
	conflicting interests	INTRS-CONF
	conflicting requirements	REQ-CONF
	process conflict	PRC-CONF
Incoherent Interactions	information process (flow) orchestration*	INF-ORCH
	database management†	DB-MNG
	information sharing†	INFO-SHR
	social activities management*	SOCIO-ACT-MNG
	collective effort*	COLLC-EFF
	system integration*	SYS-INT
	system scalability*	SYS-SCALA
	inter-organizational communication†	INTORG-COM*

* Lacking or required
† Critical, complex or troublesome

Appendix C: Pilot studies throughout different phases

Teams		Stakeholders involvement	Teams' focus	Outcome
Mobility	**Ideation**	**Stakeholders**: multiple open interviews **Users**: small scale survey among drivers	◦ Understanding the problem statement ◦ Identification of projects limitations (e.g., the problems of cars merging on highways, law and regulation, finance, and user perceptions)	◦ An initial business plan and Business Model ◦ Preliminary stakeholder analysis (mainly focused on the identification of actors and their interests and resources)
	Conceptualization	**Stakeholders**: Individual semi-structural interviews the leading companies managers **Users**: interview with a number of drivers	◦ Financial planning ◦ Business requirements, including technical potentials and project uniqueness ◦ Encouraging the leading partner to provide more resources	◦ Stakeholder analysis (business objectives) ◦ Developing a (collective) Business Model ◦ Being invited to work on the project inside the company with an intensified collaboration as a consequence
	Implementation	**Stakeholders**: brainstorm session with the leading companies technicians and management **Users**: simulation tool to evaluate users-requirements	◦ Technical requirements (e.g., requirements elicitation and *morphological* analysis) ◦ Simulation criteria (e.g., security, comfort) ◦ System operation evaluation (e.g., technical feasibility) ◦ Business and process alignment	◦ Evaluation of the solution using an advanced computer simulation tool
	Commercialization	**Stakeholders**: Discussion with the leading stakeholder regarding project follow-up **Users**: planning simulation experiment with drivers in future	◦ Scalability (and finance)	◦ The leading company has set up a new follow-up project (e.g., experimenting with actual drivers)

Energy	**Ideation**	**Stakeholders**: Open interview with a wide range of stakeholders varying from governmental institutes, NGO's, energy providers **Users**: interview with both prosumers (e.g., farmers), and consumers	◦ Understanding the problem statement, ◦ Project planning, ◦ Law and regulations ◦ Local policies	◦ An early business plan and Business Model ◦ Stakeholder identification (due to large number of actors)
	Conceptualization	**Stakeholders**: Few collective meetings with the non-governmental companies (enables by the municipality), and semi-structural interviews with related companies **Users**: semi-structural interviews with prosumers and customers	◦ Companies business requirements ◦ Reaching a consensus on business objectives ◦ Stakeholders' systems interoperability,	◦ A long list of business requirements of the involved stakeholders ◦ A (collective) Business Model for a public use, with information regarding green investment of the participating companies ◦ The list of requirements were to conflicting and complex that the team chose to exclude individual consumers
	Implementation	**Stakeholders**: Prototyping together with stakeholders **Users**: semi-structural interviews with one of the most active users	◦ Data regarding green investments ◦ Technical requirements ◦ Business and process alignment	◦ Software mock-up, only to be used by municipality and professional users
	Commercialization	**Stakeholders** and **users**: Presentation of the final solution at municipality with the presence of various public and private companies	◦ Broad diffusion of software	◦ In the end, the software was not adopted by the companies, for strategic reasons, and the software was not launched online. However, the municipality did adopt the software, to calculate the impact of green investments on overall performance, as the information required is already in possession of municipality. Nevertheless, the municipality is urged to use the software and companies data confidentially.

Health	**Ideation**	**Stakeholders**: Focus group with life-style care providers **Users**: interview with small number of patients	◦ Understanding the problem statement from medical and users viewpoint	◦ An early business plan and Business Model ◦ Stakeholder analysis (identification and collection of their interests and expectations), a collection of life-style improving interventions based on gaming elements
	Conceptualization	**Stakeholders**: Semi-structural interview with various healthcare service providers **Users**: interviews with patients and healthcare providers to make storyboards	◦ Financial planning ◦ Healthcare laws and regulations (e.g., insurance policies, medical privacy laws) ◦ Relevance of several gaming elements	◦ A Business Model for the leading online healthcare provider to include various gaming elements in combination with real-life health coaches
	Implementation	**Stakeholders**: Semi-structural interviews with the leading healthcare service provider **Users**: Testing sessions with patients	◦ Technical requirements ◦ Software testing ◦ Business and process alignment	◦ An online pilot platform (dummy)
	Commercialization	**Stakeholders**: Semi-structural interview with the leading online healthcare provider regarding solution integration within the provider's existing platform **Users**: pilot with a small number of actual patients	◦ Solution replicability for other diseases	◦ The leading healthcare provider has integrated the end-solution into its business. Also, a number of team members continued their collaboration after the project ended.

Summary

More and more companies operate in markets that are increasingly competitive. Since the industrial revolution, technological innovations and the exploitation of those innovations are essential tools for companies to distinguish themselves in the market and to get ahead of the competition. However, today's markets require more than technological innovations, efficiency or increased effectiveness alone. We are in the information age, in which data, information, (distributed) knowledge and innovative technologies are usually available to everyone, including the competition. This means that companies have to look for new avenues to create superior value. There are two paradigms that would appear to be successful: (1) companies realize that it is essential to them to shift their focus from smart technologies towards smart Business Models and (2) companies look for (sector-transcending) collaboration frameworks. With the help of Business Models, companies or networks of collaborating companies look for a 'smart' configuration of tangible and intangible resources, including technology, infrastructure and skills, to create and realize value, not only for their customers, but for themselves and other parties in the network as well. Existing scientific literature regarding Business Models provides insight into the emergence of the concept, the classifications and typologies, and the organization and structure of Business Models. Despite the growing interest in Business Model design and innovation, little is known about (1) the implementation of Business Models, (2) the way the feasibility of Business Model implementation can be analyzed and (3) which factors are relevant in that regard. In the first chapter

of this thesis, we see that the implementation of a Business Model is highly dependent on the operational business activities, processes and systems (the Business Operation), both at the level of individual companies and that of the network partners involved. The discussion in this chapter leads to the question as to how Business Models can be adapted to operational (network) processes.

The Smart Living domain is an example of a sector in which attention to technology is not enough to conquer the market or to roll out technological innovations and inventions. About forty years ago, the first articles on Smart Homes were published. These publications involved, among other things, all kinds of automated and smart devices designed to make living more comfortable, attractive and, in some cases, more medically responsible. As a result of the major technological developments in recent decades, in particular in the area of Information and Communication Technology (ICT), the Smart Home concept has been transformed into Smart Living. This concept not only includes services and products inside the home, but in particular also the interconnectivity and interactions between people and systems outside the house. Based on a literature survey, the second chapter highlights the technical focus of the domain and emphasizes the limited attention to non-technological aspects, including innovative Business Models. It is especially this latter aspect that has hampered commercialization in this domain.

Based on the introduction in the first chapter, literature on Business Models, business processes and business architectures is discussed in the third chapter. This chapter compares the different potential approaches for the analysis and organization of Business Models and business processes within a network organization. This overview has led to the identification of three crucial limitations: (1) existing studies are predominantly descriptive and not analytical in nature,

(2) they adopt a single-firm approach rather than looking at the networks of companies that are needed to develop and exploit Smart Living services, and (3) there is no frameworks for analyzing relevant operational interactions within a network environment. To address this state of affairs, a model is proposed in this chapter, the so-called Value-Information-Process (VIP) model, which is designed to analyze the feasibility of a Business Model on the basis of (1) the creation and exchange of value, (2) the production and exchange of information and knowledge, and (3) the business processes within a network organization.

In chapter four, the research approach is discussed, including how and why the multiple case-study method was used to empirically explore the operational organization of a Business Model. In addition, this chapter shows on the basis of which criteria the cases were selected, and how the data was collected and analyzed. In chapter five, four innovative, network-oriented cases from the Smart Living domain – two from Finland, one from The Netherlands and one from China – are discussed and analyzed. Inspired by the complexity theory (described in chapter three), these cases vary in the number of companies taking part in the network (i.e. network size: small-scale versus large-scale cases) and the number of roles or responsibilities within the network (i.e., network diversity: high versus low diversity of stakeholders). In line with the VIP model, and attempt was first made to map and then assess the coherence, dependencies and interactions within and between the three levels of analysis (value exchange, information exchange and process coordination).

In chapter six, the four cases are compared. The various aspects of the cases are explained on the basis of different concepts, including leadership, culture, market dynamics, regulation, network

characteristics and project phases. The chapter describes how applying the VIP model has helped identify complications at operational levels and between different actors within the network. After comparing the cases, six factors (or patterns) were identified that affect the operational coordination within the joint Business Model. In other words, in almost all the complications with regard to the exchange of value and information and process coordination that we were able to identify, at least one of these six factors has played a role. These factors involve uncertainties, scarcity of operational resources, hidden or unknown operational requirements and intentions, unilateral planning, conflicting and incoherent operational interactions.

The conclusion of the final chapter (chapter seven) indicates that the operational feasibility of a Business Model in an organizational network depends on the level of coherence between the Business Model and the underlying operational processes and systems. It is essential to take the operational idiosyncrasies, limitations and capacities within the network into account during the design of the Business Model. Although, in this thesis, four cases were examined that vary in terms of their degree of complexity (i.e. in terms of their size and diversity), the six factors mentioned earlier played a role in all four cases as having a negative impact on the feasibility of the Business Model. Needless to say, this study, like any study, is subject to a number of limitations (discussed in chapter seven). Nevertheless, we may conclude that the success of a Business Model cannot be determined by appealing outputs that brainstorm sessions about its design may yield. It is only after a careful analysis of the operational details that it is possible to determine whether or not a Business Model is feasible: *the devil is in the details.*

Nederlandse samenvatting *(Dutch summary)*

Steeds meer bedrijven bevinden zich in markten waar de concurrentie toeneemt. Sinds de industriële revolutie zijn technologische innovaties en de exploitatie van die innovaties essentiële middelen voor bedrijven om zich te onderscheiden in de markt en daarmee een voorsprong op de concurrentie te behalen. Echter, de hedendaagse markten eisen meer dan alleen technologische innovaties, efficiëntieslag of verhoogde effectiviteit. We bevinden ons in een informatietijdperk waarin data, informatie, (gedistribueerde) kennis, maar ook innovatieve technologieën doorgaans eenvoudig toegankelijk zijn voor iedereen, dus ook voor concurrenten. Hierdoor zijn bedrijven gedwongen nieuwe paden te slaan om superieure waarden te creëren. Twee paradigma's lijken vaker aanhang te vinden; (1) bedrijven zien in dat het belangrijk is om hun focus te verschuiven van slimme technologie naar slimme Business Models (oftewel bedrijfsmodellen) en (2) bedrijven zoeken (sector-overstijgende) samenwerkingsverbanden. Met behulp van Business Models streeft een bedrijf of een netwerk van samenwerkende bedrijven naar een 'slimme' samenstelling van materiele en immateriële middelen waaronder technologie, infrastructuur en vaardigheden, om zo niet alleen waarde te creëren en te realiseren voor klanten maar ook voor zichzelf en andere deelnemers in het netwerk. Bestaande wetenschappelijke literatuur over Business Models verschaft inzicht in het ontstaan van het concept, de classificaties en typologieën, en de opbouw en structuur van Business Models. Ondanks de groeiende belangstelling voor Business Model ontwerp, innovatie en vernieuwing, is er weinig

bekend over (1) implementatie van Business Models, (2) hoe de haalbaarheid van implementatie van Business Models kan worden geanalyseerd en (3) welke factoren daarbij van belang zijn. In het eerste hoofdstuk van deze dissertatie zien we dat de implementatie van een Business Model sterk afhankelijk is van de operationele bedrijfsactiviteiten, -processen en -systemen (oftewel Business Operations) zowel op het niveau van het individuele bedrijf als van betrokken netwerkpartners. De discussie in dit hoofdstuk leidt tot de vraag hoe Business Models kunnen worden afgestemd op operationele (netwerk) processen.

Het Smart Living domein is een voorbeeld van een sector waar de aandacht voor technologie niet voldoende is om de markt te veroveren en evenmin om technologische innovaties en uitvindingen uit te rollen. Ongeveer veertig jaar geleden verschenen de eerste publicaties over Smart Homes. Deze publicaties waren onder meer gericht op allerlei zelfbesturende en intelligente apparaten om wonen comfortabel, aantrekkelijk of in specifieke gevallen medisch verantwoord te maken. Als gevolg van de grote technologische vooruitgang in de afgelopen decennia, met name op het terrein van Informatie en Communicatie Technologie (ICT), heeft het Smart Home-concept een transitie doorgemaakt naar Smart Living. Dit concept richt zich niet alleen op diensten en producten binnen het huis, maar met name ook op de interconnectiviteit en interacties tussen mensen en systemen buitenshuis. Het tweede hoofdstuk weergeeft op basis van een literatuurstudie de technische focus van het domein en benadrukt de beperkte aandacht voor niet-technologische aspecten waaronder innovatieve Business Models. Met name deze tekortkoming heeft het valorisatieproces in dit domein gehinderd.

Voortbouwend op de inleiding in het eerste hoofdstuk, wordt in het derde hoofdstuk de literatuur over Business Models, bedrijfsprocessen en -architectuur behandeld en worden diverse theorieën uitgelicht. Dit hoofdstuk vergelijkt verschillende potentiële benaderingen voor het analyseren en afstemmen van Business Models en bedrijfsprocessen binnen een netwerkorganisatie. Dit overzicht heeft geleid tot identificatie van drie cruciale beperkingen (1) bestaande onderzoeken zijn voornamelijk beschrijvend en niet analytisch van aard, 2) dit onderzoek richt zich op een "single-firm" benadering en niet op netwerken van bedrijven die noodzakelijk zijn om Smart Living diensten te ontwikkelen en te exploiteren, en (3) het ontbreken van een raamwerk dat relevante operationele interacties binnen een netwerkomgeving analyseert. Om deze lacune aan te pakken, wordt in dit hoofdstuk een model voorgesteld, het zogenaamde Value-Information-Process (VIP) model, dat ernaar streeft om de operationele afstemming van een Business Model op basis van 1) waardecreatie en -uitwisseling, 2) productie en overdracht van informatie en kennis, en 3) bedrijfsprocessen binnen een netwerkorganisatie te analyseren, implementeren en evalueren.

Hoofdstuk vier beschrijft de onderzoeksbenadering. Hierin wordt besproken hoe en waarom de "multiple case-study" methode is toegepast om de operationele afstemming van een Business Model op een exploratieve wijze empirisch te bestuderen. Daarnaast laat dit hoofdstuk zien op basis van welke vereisten de casussen zijn geselecteerd, en hoe data is verzameld en geanalyseerd. In hoofdstuk vijf worden vier innovatieve, netwerkgeoriënteerde casussen -twee uit Finland, één uit Nederland en één uit China- uit het Smart Living domein besproken en geanalyseerd. Geïnspireerd door de complexiteitstheorie (beschreven in hoofdstuk drie), variëren deze casussen in het aantal participerende organisaties binnen het netwerk (dat wil zeggen groot- en kleinschalige casussen) en de mate van

diversiteit van de bedrijfsrollen binnen het netwerk (dat wil zeggen hoge en lage diversiteit binnen het netwerk). Conform het VIP model is eerst getracht om vanuit het netwerkperspectief de samenhang, afhankelijkheden en interacties binnen en tussen de drie analyse niveaus (dat wil zeggen waarde en informatie uitwisseling en procesafstemming) in kaart te brengen en dit vervolgens te evalueren.

In het zesde hoofdstuk worden de vier casussen met elkaar vergeleken. De verschillende aspecten van deze casussen zijn verklaard vanuit diverse concepten, onder meer leiderschap, cultuur, marktdynamiek, regelgeving, netwerkeigenschappen, en projectfasen. Het hoofdstuk beschrijft hoe het toepassen van het VIP model heeft geholpen om complicaties op operationele niveaus en tussen verschillende actoren binnen het netwerk vast te stellen. Na de casussen met elkaar vergeleken te hebben zijn zes factoren (of patronen) gevonden die van invloed zijn op operationele afstemming binnen een gemeenschappelijk Business Model. Met andere woorden, bij vrijwel alle geïdentificeerde complicaties op het gebied van waarde- en informatie uitwisseling dan wel procesafstemming heeft minstens één van deze zes factoren ten grondslag gelegen. Deze factoren behelzen operationele onzekerheden, schaarsheid aan operationele middelen, verborgen of onbekende operationele behoeften en intenties, unilaterale planning, conflicterende en incoherente operationele interacties.

De conclusie in het laatste hoofdstuk (hoofdstuk zeven) wijst uit dat de operationele haalbaarheid van een Business Model in een organisatienetwerk afhankelijk is van de mate van samenhang tussen het Business Model en de operationele processen en systemen. Daarbij is het van essentieel belang om tijdens het ontwerpen van een Business Model rekening te houden met de operationele kenmerken,

beperkingen en capaciteiten binnen het netwerk. Hoewel in dit onderzoek vier casussen zijn onderzocht die qua complexiteit verschillen (dat wil zeggen qua grootte en diversiteit), spelen de zes genoemde factoren in alle casussen een rol en hebben ze een negatieve impact op de haalbaarheid van het Business Model. Het is vanzelfsprekend dat dit onderzoek, zoals elk wetenschappelijk onderzoek, onderhevig is aan een aantal beperkingen (toegelicht in hoofdstuk zeven). Desalniettemin kan worden geconcludeerd dat het succes van een Business Model niet kan worden bepaald door fraaie brainstormresultaten over het design ervan. Pas na een minutieuze analyse van de operationele details kan worden geconcludeerd of een implementatie haalbaar is: *the devil is in the detail!*

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