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Smart Home: Aligning Business Models and Providers Processes; A case survey

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Abstract

Smart Home projects require product, service and business model innovation by organizations from multiple sectors. A considerable number of Smart Home projects, however, fail to live up to expectations and to commercialize their services. Business models that enable these projects have to be viable and feasible for the project as a whole as well as for individual involved providers. Moreover, the processes of involved providers have to be aligned, and exchange of information and value has to be well defined. In this paper, we propose three alignment domains that address the operational interactions between the involved providers. Based on a case survey it can be concluded that insufficient attention is paid to the alignment of Business Model as well as to Business Processes between involved providers, who are an essential to service innovation in a value network.

Keywords

Service Innovation, Smart Home, Business Model, Business Processes, Alignment.

INTRODUCTION

Smart Home concept has attracted attention from researchers and business for more than 40 years. The concept evolved from a specific area of Domotica, via Smart Homes, to the much broader concept of Smart Living. The main driver was the opportunities that specifically ICT related technologies offer. Interest from industry is diverse. Energy providers see opportunities for ICT-enabled smart energy management. Telecom, Cable and Media companies, as well as hardware providers see opportunities for the house to become an entertainment experience centre. Security providers see distant surveillance, control and safety equipment as options for new business. Healthcare providers see the opportunities for sensor networks connected to smart devices that will enable elderly and people with a chronic disease to stay in their personal environment longer, leading to cost reduction in the Medicare domain. All these ideas have been around for a number of years, and many pilots and demonstrators have been built. Although houses contain more and more smart devices, the concept of smart houses is seldom realized on a large scale, and did almost never lead to an integration of applications s.

Multiple explanations are possible. From a technology perspective, the lack of common standards within and between industry sectors, the lack of a common service platform supported by multiple industries, incompatible infrastructures, and the fast pace of innovation all lead to sub-optimal use of new technologies and the slow introduction of Smart Living concepts. From a strategic perspective, collaboration in demonstration projects most of the time doesn't lead to problems, but when large scale projects are implemented the individual interests from companies in different industries sectors, as well as strategic considerations become dominant. Competition between industries instead of collaboration becomes a threshold for further developments. *Dominant actors (dominators)* are focused on creating and capturing value for themselves and leave little for others (Basole 2009). Many projects promote only one aspect of Smart Living, starting from closed innovation concepts (Chesborough 2003). In short, strategic behavior hinders the development of viable and feasible business models for Smart Living projects.

The effectuation of alignment within and between business models and organizational processes cuts across multiple levels of analysis, both strategic and operational. In this study, the focus is on the stage that follows strategic collaboration, when multiple actors collaborate and key players focus on creating and sharing value across the system. Business model viability and feasibility are analyzed from an operational perspective. Extensive research in the mobile telecommunication domain (Bouwman et al. 2008; De Reuver et al. 2009) has shown that misalignment or complexity of operational processes hinders the viability and feasibility of a business model. In the same way, Smart Living projects are likely to succeed when the business models are viable and feasible for the project as a whole as well as for individual involved providers. We argue that business model,

i.e., the logic of intended innovation, should be supported by "aligned" (operational) business processes between and within the involved providers.

Literature in terms of the discussed alignment is scarce as well, while literature on business models is abundant (e.g., Bouwman et al. 2008; Nilson et al. 1999; Oosterwalder and Pigneur 2002; Pateli and Giaglis 2004), and even larger on business process modeling (e.g., Giaglis 2001; Lin et al. 2002; Recker and Rosemann 2009; Yu and Wright 1997). However, relatively limited numbers of studies tackle the issue of alignment of business models and business processes in a multi-actor setting, as well as the information and the value that is exchanged between the involved actors. This paper aims to combine business model and business process modeling literature to reveal the core aspects of alignment and to develop an alignment framework. The alignment framework is used to analyze: *how and to what extent business model/business process model alignment in Smart Living service innovation is considered in R&D phase of service innovation?* To answer our research question, we first focus on the Smart Living domain. Then relevant literature with a focus on business models, business modeling and process analyses is discussed. In addition, an overview of the state-of-the-art in alignment between business models and business process models is provided. Based on this literature, a framework is developed that will be used in our empirical analysis, making use of a case survey of Smart Living projects. Finally results will be discussed.

SMART HOME IN A NUTSHELL

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 contexts. Barlow and Venables (2003) provide an overview with regard to mobile application and Smart Home. Chan et al. (2009) discuss e-health in Smart Homes. A collection of Smart Metering projects all around the world is presented by Gerwen et al. (2006). Several Smart houses have been built to investigate the smart technologies in urban dwellings (e.g., Chen and Chang, 2009). From a technology perspective, a Smart Home is seen as a house or living environment that contains the technology to allow devices and systems to be controlled automatically (Zheng and Pulli 2007). For healthcare purposes, a Smart Home is interpreted as a residence that provides disease prevention possibilities, monitoring and/or assistance with health-related issues of its inhabitants with the purpose of improving their quality of health (Chan et al. 2008; Demiris et al. 2004). From an energy provision perspective, a Smart Home is defined as house automation for energy management that provides application to control heating, ventilation and lighting so that it can contributes to saving energy (Rohracher 2001). In this study, a broader definition of Smart Home provided by Aldrich (2003, pg. 1) is used. "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 we add *health* as another vital need of the occupants to his definition. The last part of Aldrich's definition, stress the notion of "informational" home where existing and new information services are interactively connected to the world outside, rather than, merely the "automation" of home appliances (Glann et al. 1999). The notion that Smart applications are not limited to the dwelling or home per se makes it clear that the Smart Home concept is limited, and therefore the concept *Smart Living*, indicating that Smart applications can be accessed remotely, or even distributed, is used. More and more discussion emerges on Smart Communities, Cities (IBM[1]) and Factories (Zuehlke 2010)

The recent fast-paced developments in technology have created a new wave of interest in Smart Living (Cook and Das 2007; Peine 2008), many Smart Living service providers fail to commercialize their services (Harper 2003; Peine 2008). Perhaps the limited diffusion of Smart Home services can be attributed to the lack of insight into social context and users' demand (e.g., Aldrich 2003; Gann et al. 1999; Venkatesh 1996). Interoperability and complexity of Smart Living related hard- and software is another repeatedly named barrier (e.g., Gu 2005; Helal et al. 2005; Papadopoulos et al. 2009). Several standards have been developed such as the Open Services Gateway Initiative[2] (Marples and Kriens 2001), P2030[3] smart grid interoperability standard provided by IEEE, or ZigBee[4] high level communication protocol based on the IEEE standard for wireless personal area networks (WPANs). Legacy stove-piped infrastructure, i.e. separate access networks for television, Internet and even energy grids in today's homes and high initial investment are two other concerns (e.g., Aldrich, 2003; Edwards and Grinter 2001). This paper, focuses on seldom discussed elements of Smart Living concepts, i.e. Business Model and underlying business processes of involved actors. We argue that only when multiple actors collaborate and focus on creating and sharing value, Smart Living concepts are likely to succeed. Next to

[1] http://www.ibm.com/smarterplanet/us/en/sustainable_cities/visions/index.html (Last accessed on July 2010)
[2] www.osgi.org (Accessed on July 2010)
[3] http://grouper.ieee.org/groups/scc21/2030/2030_index.html (Accessed on July 2010)
[4] http://www.zigbee.org/ (Accessed on July 2010)

strategic choices, feasible and viable business models for value networks as a whole, as well for individual actor in Smart Living concepts have to be considered, while operational processes between organizations have to be aligned.

ALIGNMENT OF BUSINESS MODEL AND BUSINESS PROCESS MODELS

Business Model are defined as "a blueprint for a service to be delivered, describing the service definition and the intended value for the target group, the sources of revenue, and providing an architecture for the service delivery, including a description of the resources required, and the organizational and financial arrangements between the involved business actors, including a description of their roles and the division of costs and revenues over the business actors" (Bouwman et al., 2008, pg. 33). Two issues need clarification. First, Smart Living is not only about services but also about products that enable these services. User experience and the value the customer attributes to the Smart Living, i.e. making life more pleasant, efficient and effective; attributing to status, hedonistic values and increased flexibility; are core. Second, a network of companies delivers the Smart Living concept to the customer, and creates value for involved providers. The focus in this paper is not on customer value, but on a provider point of view, focusing on how multiple actors deal with the business model for the Smart Home concept in general as well as how this is related to their individual business models. We focus on organizational collaboration.

Nearly every step in innovative service (or product) life cycle, from discovery to distribution, goes through various forms of corporate partnering (Powell et al. 1996) that may transcend traditional industry boundaries. A less discussed but increasingly growing form of corporate partnering is via trans-sector value networks. We define a trans-sector value network as: "a -technology enabled- network of actors from distinct industries that aggregates their resources and capabilities in order to create and capture value from a service." In our definition, an industry refers to a branch of commercial enterprises concerned with the output of a specified product or service[5] (i.e., health, energy, education, telecommunication, security and so on). A platform is mainly technical in nature, but is supported by the actors involved. We can identify at least three basic types of actors in a Smart Living project (Hawkins 2002) *Structural partners* provide essential and non-substitutable tangible and/or intangible assets to the value network on an equity or non-equity basis. They play a direct and core role in determining the intended customer value and in creating the business model. *Contributing partner* provide goods and/or services to meet requirements that are specific to the value network, but otherwise play no direct role in determining the intended customer value and in creating the business model. If the assets they provide are substituted, the intended value and the business model remain intact. *Support 3 partners* provide generic goods and services to the value network, without which the value network would not be viable, but which can be acquired from many different actors. The scope of this study is limited to the role of structural partners. Their motives for being involved in Smart Living project can be diverse, gaining knowledge, getting access to future strategic partners, but also commercial. Their involvement will be legitimized by the fact that the business models have to create value for the individual structural partner as well.

Next to more strategic considerations, we argue that there are a number of practical or operational issues that stimulate or hinder Smart Living concepts. A Business Model describes *what* the business ought to be doing in order to deliver and capture value; however, *how* this done requires in-depth know-how of underlying processes. Davenport (1993, pg. 5) defines 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.*" Moreover, "*Processes also have performance dimensions-cost, time, output quality, and customer satisfaction- that can be measured and improved."* Process literature provides a vast array of topics that generally focuses on Business Process Modeling (e.g., Giaglis 2001; Yu and Wright 1997; Lin et al. 2002; Recker and Rosemann 2009), Business Process Reengineering (e.g., Yu and Wright, 1997; Lin et al., 2002), or Business Process Management (e.g., Lee and Dale 1998; Van der Aalst et al. 2003; Weske 2007). Relatively few studies are dedicated to business models and business processes alignment as well as to alignment of business processes of structural partners. Available studies are discussed in the next section.

BUSINESS MODEL/ BUSINESS PROCESS MODELS ALIGNMENT

In this section we provide an overview of the state-of-the-art in alignment between Business Models and Business Processes that helps us (1) to reveal the core alignment aspects, and (2) to position our approach among the existing approaches. Within the scope of strategic management, Edirisuriya and Johannesson (2009) discuss

[5] Collins English Dictionary – Complete and Unabridged 6th Edition 2003. © William Collins Sons & Co. Ltd 1979, 1986 © HarperCollins Publishers 1991, 1994, 1998, 2000, 2003.

three alignment approaches: unified framework (Jayaweera 2004), chaining methodology (Andersson et al. 2006a), and e3transition approach (Pijpers and Gordijn 2007). They address the issue of traceability as the main weakness of these approaches. Traceability, next to Business Orientation and Flexibility are the three main shortcomings and challenges of process modeling techniques (Andersson et al. 2005). Based on Activity Dependency Model (ADM) (Andersson et al. 2005), Edirisuriya and Johannesson (2009) present a number of transformation rules to construct a process model from a business model. Bergholtz et al. (2005) elaborate on ADM approach and provide an integration methodology to derive e3value model (Gordijn and Akkermans 2001) from Business Model Ontology (BMO) (Osterwalder 2004). Andersson et al. (2006b) have constructed a common ontology for business models using e3value model, Resource-Event-Actor (REA) (McCarthy 1982) and BMO. Weigand et al. (2007) provides a set of rules to derive process model from an e3value model.

In strategic management literature, Business Architecture (BA) is proposed as a disciplined approach that helps multiple organizations align responsibility over economic activities on different levels of organization (i.e., from strategic to operational) (Versteeg and Bouwman 2006). Object Management Group[6] defines Business Architecture as: "A blueprint of the enterprise that provides a common understanding of the organization and is used to align strategic objectives and tactical demands." BA helps to clarify the relationship between strategy of an organization and the way it is organized, in terms of information, process and application architecture

There are a number of high-level shortcomings that are of importance to business models and business processes alignment. All the existing alignment approaches are either based on value-based model (i.e., focused on value exchange between actors), or BMO model, which both have specific shortcomings. Value-based models do not pay attention to information exchange between the involved actors, and the BMO model provides a strategic view of the whole enterprise rather than fine-grained insight into actors' information and value exchange or operational processes. None of the mentioned approaches are meant to be applied in a multi-actor setting where different business models and process model are in place. Alignment of business models/business processes is related to more than only value exchange and it can only be obtained when we focus on exchange of value, exchange of information, and operational processes between and within the involved actors. All three have impact on alignment between business model and processes.

DOMAINS OF ALIGNMENT

On a process level (1) how value exchange takes place, (2) how information is exchanged between structural partners, and (3) how operational processes are connected and aligned. At the end of this section, all three alignment domains are recapitulated in Table 1.

Value Exchange

In trans-sector value web, multiple actors with a wide range of diverse and often conflicting interests have to work together. Involved actors have different strategic objectives. Each actor has its own rationale, definition and interpretation of how they contribute to the generic service value proposition within the value network. Porter (1985) defines value as the amount of money buyers are willing to pay for a service (or product). In value network the buyers are both customers and collaborating business partners. Bouwman et al. (2008) refers to the "intended value", which is the value a provider intends to offer to customers or end-users of the service. On the other hand, Gordijn and Akkermans (2001) refer to "value exchange", which are the value objects exchanged between the collaborating enterprises. In this paper, we endorse *Process Requirements Engineering* suggested by Gordijn et al. (2000), which focuses on the question "*what* is offered *by* whom *to* whom". Two examples are: value-based (e.g., *e3-value*: Gordijn and Akkermans 2003), and goal-based (e.g., *i* modeling framework*: Yu 1997). The former technique aims to capture how and what business "values" are exchanged between actors within a value network. The latter technique focuses on strategic incentives for particular requirements to uncover the "goals" which are behind the new business values and business models (Casteleyn 2009).

Information Exchange

The need to access resources creates resource dependencies (Pfeffer and Salancik 1987), which has a profound impact on any trans-sector collaboration. In the service innovation domain, *information* plays a vital role, given the importance of information and communication technologies as enablers for new services. Weill and Vitale (2001) stressed that Business Model viability depends on access to information (e.g., about customers, products, markets, and costs) and the ability to identify, capture, share and exploit the key information strongly influences

[6] http://bawg.omg.org (Last accessed on July 2010)

business model viability and feasibility. An example of information resource is, "owning and controlling the transaction", which is a very enviable position for any company that empowers the actor involved to claim a share of the revenue and control the customer transaction data (Weill and Vitale 2001). So, besides the value-based model discussed in the previous section, we also need to decompose the interaction between actors into a finer information exchange analysis that reveals the information resource dependencies and necessities of the involved actors. We distinguish information resources from value objects (discussed in previous sub-section) by defining value objects as money or good, and not information resources. Borrowed from Business Architecture literature (Versteeg and Bouwman 2006), we argue that this separation is imperative in the context of Business Model and business process alignment in trans-sector value network. In this context, information flow steers the collaborations on both strategic and operational levels with intensity no less than value objects. We follow the definition of Tongrungrojana and Lowe (2003) who define *Information Flow Model* as: "a requirements analysis model that helps to define and analyze, at a high abstraction level, the information flow between the system, the organization and the external entities." There are several information modeling approaches that can be used to analyze information flow between actors. An example is WebML+, which is built around the notion of information flows at the level of connection to business processes (Tongrungrojana and Lowe 2003). The UN/CEFACT Modeling Methodology (UMM)[7] is another modeling approach that uses UML (Unified Modeling Language) as a base for modeling collaborative business processes involving information exchange in a technology-neutral and implementation-independent manner.

Business Processes

Business processes describe *how* the activities, with their relationships, are performed in organization. Business Architecture advocates alignment of high level strategy with the operational business processes. We define a *Business Process Model* as a fine-grained systematic representation of business processes. The process typology provided by Mooney et al. (1996) shows two kinds of business processes: Operational and Management Processes. The former type includes production processes, design and development processes, product and service delivery processes, while the latter type includes coordination, control, knowledge or communication processes. A detailed view on processes (activities) and their execution constraints within a *single* organization are provided in process *Orchestration* (Janssen et al. 2006). There are many Business Process Modeling approaches on different levels of abstraction, including Petri nets, ARIS (Architecture of Integrated Information Systems), and IDEF-family[8] (Integrated Definition methods). Also different modeling approaches have been developed that provide a notation that is readily understandable to all business users, technical developers or people who manage and monitor processes, e.g., BPMN (Business Process Modeling Notation) or UML. The complexity of business processes, however, increases if actors from different industries are involved. In trans-sector value networks, different actors with different process orchestrations interact with each other. The process *Choreographies* aim to improve the interoperability between process orchestrations (Weske 2007). Also here, different standards are provided by industry, including: RosettaNet (supply chain domain), SWIFTNet (financial services) and Health Level Seven (health care services).

Table 1. The three Business Model/Business Process Model Alignment Domains

Alignment Domains	Value Exchange	Information Exchange	Business Processes
Modeling Approaches	Process Requirements Engineering	Information Flow Models	Business Process Models

RESEARCH METHODOLOGY

In previous section, we discerned three core domains of Business Models/Business Process Models alignment. The alignment domain are used as a lens to analyze how business model/business process model alignment in Smart Living service innovation is realized. The unit of analysis in this study is Smart Living projects, which are dominated by heterogeneous collections of Smart Living concepts covering a broad spectrum of topics, such as usability, security, standardization but also project implementation, product prototyping or technical innovation. According to Yin and Heald (1975), a *case survey* is the most appropriate method to evaluate such a heterogeneous collection of data. The case survey method is an inexpensive way to aggregate existing research in order to identify the lessons from decentralization studies and other organizational case experiences (Lucas 1974). According to Lucas (1974), the case survey method includes a number of steps: (1) searching and sampling, (2) concept specification, (3) concept reliability and validity, and (4) from theory to conclusion.

[7] http://www.unece.org/cefact/umm/UMM_userguide_220606.pdf (Last accessed on July 2010)
[8] http://www.idef.com (Last accessed on July 2010)

Likewise, the first step of our case survey is collecting relevant Smart Living projects from peer-reviewed journals, conference proceedings and other forms of publications (including book chapters, commercial experiments, etc.). We used web search engines Google Scholar and Scopus to trace a list of relevant publications. We drew a final list of publications from a wide variety of academic publishers such as Elsevier Science Direct, Emerald Library, Springer, JSTOR, IEEE Computer Society, Wiley InterScience, Human Technology and ICST Institute for Computer Science, Social-Informatics and Telecommunications Engineering. There are quite a few interchangeable terms that refer to the Smart Living concept. To select relevant contributions, we used the following search terms: smart home(s), smart living, home automation, ambient intelligence, intelligent home(s), and ubiquitous computing. In the first selection round, these terms had to be mentioned in the title, the keywords or the abstract of publication. At the same time, we reviewed the extracted publications in terms of included references to other potentially relevant publications. A screening of titles, abstracts and keywords to assess the relevance and completeness of each case yielded a final sample of 62 publications. All these publications had at least one of the mentioned search terms as part of title, keywords or abstract. Next, we refined the collection by excluding cases with inferior quality. Lucas (1974, pg. 10) labels this stage as "*methodological exclusion*" and defines it as "*development of rules to guide rejection of cases on methodological grounds.*" In this stage, the publications were subjected to a full-length screening. Those publications were excluded that:

1. Do not give a broad description of a Smart Living concept. Most of the Smart Living publications are focused on a general Smart Living related issue such as usability, security or standardization etc. In this study, we rather are interested in those publications that provide a comprehensive description of a Smart Living concept consisted of a broad range of technical, organizational, strategical or financial components.
2. Do not involve multiple actors from different sectors. As mentioned in section three, the focus of this paper lies on trans-sector collaborations in which different providers (at least more than one) combine their forces to create and provide new Smart Living service(s).
3. Do not include topics related to Business Model/Business Processes Model or alignment in between. Some cases describe a full Smart Living concept but solely from consumers' point of view or are limited to technical development details. We looked throughout the cases for indicators that show the case relevance. The indicators were discussions about concepts such as business models, business modeling, business processes, business processes models etc.; but also diagrams that illustrate business models, business process models, value or information flow/exchange, role/responsibility division and such.

Eventually, five cases are selected that are relatively well-matched with our selection criteria. During the case selection, we discovered that most Smart Living concepts are mono-sector, triggered by a technology-focused company. Furthermore, we selected only five cases as almost all others are user-centered and/or technology-driven, paying hardly any attention to business models of the involved providers. Authors are mainly focused on user needs and limitations, like Human Computer Interaction (HCI) issues, interface design, user behavior etc., or more technical-oriented issues, such as interoperability, functions, security, etc. The selected Smart Living cases, case authors and case analysis are presented in Table 2. We red all the cases while attempting to answer the following questions: *Which*, *How* and *To what extent* are the three defined alignment domains discussed or applied in the selected cases?

Additionally, to make sure that the selected case descriptions are not biased towards authors' interests; we invited all authors for a semi-structural interview. Three of the six invited authors were available to join in. In these interviews, we aimed to find out *why* en *how* they considered the interactions between and interests of the involved providers (e.g., in terms of three alignment domains).

Table 2. Case Survey Results

Case	Authors	Process Requirements Engineering	Business Information Flow Analysis	Business Process Models
Remotile (mobile home automat-ion)	Rosendahl, Hampe and Botterwerk (2007)	From a technical viewpoint (p. 17), a number of actors (users and providers) are presented in an architectural diagram; however, the actual value exchange between these actors is missing. On page six, the values of the services for users are named; however, nothing is mentioned about	On page seven, the authors explain in technical terms how the data transfer between user and device should be realized. Subsequently, a brief technical communication overview between user and a device is presented (p. 8). The information needs from	A high-level (user to the service) scenario comparison is presented on page 18. On pages 19-22, the (possible) technical functionalities of the service are discussed. On page 20, a very small diagram of two functions of service is presented. On page 23, three possible service implementation alternatives from user's viewpoint are presented. The paper, however, does not provide an

		the value that the involved providers will get/provide from/to each other.	the user perspective are described in eight pages (pp. 9-16). The information flows between providers is not discussed.	overview of the involved providers' processes. Moreover, no attention is paid to alignment of different processes - belonging to different providers- that should be run in conjunction with each other.
Intelligent Refriger-ator	Hsu, Yang and Wu (2010)	The basic concept of refrigerator is sensing the lack of food and auto-dial the regarding vendor(s) and delivering the ordered product(s) to the customer with empty fridge. On page three a basic graphical design of the whole structure is illustrated. Although different actors (providers) are involved, marginal attention is paid to the value creation/exchange between these actors.	N/A	Beside the diagram on page three that shows the connection and activities between the actors, no other information (textual or graphical) could be found that explicitly clarify the alignment between different actors' process models. For example, how orders coming from refrigerator can be collected, validated, allocated, shipped and delivered by different food suppliers, transport agencies, internet intermediaries etc. in order to provide the customer the best (quality, price etc.) product(s) in time, is excluded.
Mobile Services for Senior Citizens	Zheng and Pulli (2007)	On page six, the authors describe four major players and their roles. However, no attention is paid to the exchange of value (or even creation of value) for the involved providers.	N/A	In an architectural scheme the involved actors and a number of technical components (and the interactions within and in-between actors and components) are graphically represented (p. 5). The paper, however, lacks in representing an aligned sequential flow of different processes between and within the involved providers.
Smart House for older persons and persons with physical disabilit-ies	Stefanov, Bien and Bang (2006)	User-centric approach is the dominant voice throughout the paper, however, value creation or value exchange on providers' side is not considered at all.	On page three, various devices of home network are depicted. The home network is also linked via data channel to different data providers such as medical staff, therapist, helpers or security guard. On page 12, the information exchanges between devices are explained, however, here again information flow between on providers' side is excluded.	On page 17, a functional architecture in the form of block diagram is presented. The diagram shows in a systematic way how different components of home network, or more specific, Intelligent Robotic House (IRH), are connected. The diagram, however, doesn't specify what activities are in place and how these activities are interrelated. A major part of paper is dedicated to the technical description of home network devices (pp. 2-13).
Smart Energy Manage ment System (SEMS)	Desai and Singh, (2010)	On page six, a graphical representation of SEMS pilot is provided. On this diagram it is clear that different actors such energy provider (e.g., control center), telecommunication provider (e.g., infrastructure), mobile service provider (mobile application) are involved. The diagram shows the connection between different actors (and devices); however, it does not explain what value is/should be created or exchanged by/between the providers.	On page three, system architecture of SEMS is presented. The architecture shows the technical components (and their relations) that constitute the service. Among other technical components different data components such as data collection and management engines, database, security etc. are individually explained. It is however not clarified what information should be exchanged between which providers.	N/A

RESULTS

The case survey shows that value exchange in the selected cases is primarily associated with compatibility of devices with different technical specifications stemming from different providers. The communication between

technical devices and users is another point of interest in the cases. In some cases, we see that the values that providers should deliver to the users/customers are discussed. However, the values created by or exchanged between the involved providers have hardly received any attention in all the cases.
Exchange of information seemed to be less exciting since less attention is paid to this domain compared to the other two. Those cases that showed interest discuss information exchange mainly from a technical point of view (e.g., database, data channel, data security, etc.) or from users' view (e.g., data exchange between device and user, user understanding of data, etc.). Yet, how information as a strategic resource is distributed, authorized, accessed or exchanged between and within the involved providers was not discussed.
The process alignment was mainly expressed in terms of actors' activities and in some cases enriched with the connections between these activities. These illustrations of activities have two shortcomings. One is that they provide an abstract view of the concept rather than a comprehensive view that explicates how the processes of different providers are interrelated and interconnected. On the other hand, the illustrations are limited to merely one perspective (e.g., technical functionalities or systems processes), and neglect business or organizational processes (e.g., billing processes or after-sale customer care).

The interviews pointed in a similar direction. In response to question why the author did not consider the providers' interests in proportion to other issues, one[9] interviewee said: *"…honestly I didn't have enough knowledge about stakeholder's analysis."* In addition to lack of knowledge, the authors' preferences can be marked as another motive to neglect provider's points of view: *"…the team I was working with was consisted of primarily technical engineers who want to see things functioning rather than doing stakeholder analysis."* Some authors deliberately decide to focus on technical novelty of their service for fund-raising purposes: *"I was not interested in providers' processes, because first you want to see funding."* The intentional exclusion of provider's side also has to do with the scope of project: *"we had a technical service in our mind and we aimed to work toward a prototype…we didn't spend lot of time thinking about providers interests at length".* One interview brought forward that sometimes the authors believe that providers' issues will/should be considered in latter stages: *"…we believed that the interested parties will figure out in latter stages how to deal with the other possible involved actor(s)."* Finally, even when authors are considering providers perspectives, there is barely an explicit attention for all three alignment domains at the same time. Occasionally, we see that one or two domains are to some extent considered, rather than in a comprehensive integrative way that includes all three alignment domains discussed in this paper.

CONCLUSION

Increasingly, Smart Living concepts constituted by different actors from different industries (sectors) are emerging. Many of these trans-sector Smart Living concepts, however, fail to reach the commercialization or even implementation stage; the focus is still on R&D. There are several well-known explanations in circulation, including, the general immaturity of the Smart Living sector as a whole, the lack of readily adoptable technologies or lack of consumers' interest. In this paper, however, we focused on provider's operational involvement in Smart Living service innovation. We argued that insufficient attention towards providers involved in value network from the start, might reduce the viability of the Smart Living concepts as well as business models viability and feasibility. Based on literature on business models and business process modeling, we proposed an alignment framework that is composed of three alignment domains, i.e., "Value Exchange", "Information Exchange", and "Business Processes" between and within the involved providers. Based on our alignment framework, we conducted a case survey and a number of interviews to find out how and to what extent business model/business process alignment between stakeholders are considered. The case study and interviews show a lack of intentional or unintentional attention towards a *provider-driven* approach, i.e., explicit involvement of providers in service innovation with focus on alignment of operational processes (1) between the involved providers, and (2) with the generic business model. The results show that in the selected Smart Living cases, the providers' involvement is seen as a *given* fact rather than an active and dynamic stakeholder with great impact on business model that enables the intended service innovation. This paper contributes in two ways. Regarding theory, our alignment framework is a comprehensive starting point that addresses the existing theoretical gap in business model and business process modeling literature. Regarding practice, we recommend both researchers and practitioners to put more emphasis on the provider's side, especially on the discussed alignment domains, in order to improve business model viability and feasibility.

Indeed, we are fully aware that only a limited number of cases and interviews are the basis for our conclusions. However, this limitation does not interfere with the very nature of this study, which is exploring how attention is

[9] The interviews are conducted anonymously in order to create a room to also talk about the unnecessary mistakes, hidden agendas, and colleagues or project leaders with detrimental impact.

given to business model/business processes alignment in multi-actor setting, rather than assessing any statistical significance. In the future, we will collect more data from the field (e.g., by case study) to gain in-depth insight into the explicit and implicit ways that involved stakeholders deal with business model as well as process alignment issues across industry sectors. On the other hand, we will apply the three discussed alignment domains in practice to evaluate their impact on business model's viability and feasibility in order to develop the suggested alignment domains in more detail.

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