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EaaS: Electricity as a Service?

Yueqiang Xu[1, *], Petri Ahokangas[1], Emmanuelle Reuter[2]

Abstract

Purpose: Like a number of other traditional industries, the energy industry is undergoing a major transformation. With the advent of smart grids, the industry is transforming from a centralized energy system to a distributed energy network, and from the traditional product-based to a service business model. An essential question is "What types of value creation and value capture opportunities emerge at the level of ecosystems as the energy and smart grid industry shifts from the existing product-based business model to a greater service orientation?"

Design: The study utilizes the 4C ecosystemic framework and the XaaS (Everything as a Service) digital service business model typologies, and collects business model case data from 15 EU Horizon 2020 innovation projects. The research uses a two-stage approach that includes interpretive case analysis and action research to analyze and create an ecosystemic business model framework.

Findings: The paper uncovers the following business model typologies for the digitalization of the energy business ecosystem: Connection as a Service (CaaS), Supply as a Service (SaaS), Data as a Service (DaaS), and Energy Application as a Service (EAaaS).

Research limitations/Implications: A key outcome is the proposition of the Electricity as a Service (EaaS) concept for the energy sector, proposing a new service business paradigm for the energy ecosystem. One limitation is that the research has a strong regional focus on European cases.

Originality / Value: The study adopts a value-based and service-dominant lens focused on business model research at the ecosystemic level. For the first time, the study introduces the XaaS service business typology, investigating how this well-established ICT (Information and Communication Technology) business framework can enable the digitalization of the energy industry.

Keywords: business model, business ecosystem, service-dominant logic, value-based strategy, XaaS, SaaS, smart grid, electricity-as-a-service.

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1 Martti Ahtisaari Institute, Oulu Business School, University of Oulu Pentti Kaiteran katu 1, P.O. Box 4600, FI-90014 Oulu, Finland
Yueqiang.Xu@oulu.fi, Petri.Ahokangas@oulu.fi

2 University of Neuchâtel, Switzerland Institut de l'entreprise - Rue A.-L. Breguet 2 - 2000 Neuchâtel, Switzerland
Emmanuelle.Reuter@unine.ch

* Corresponding author: Yueqiang Xu, Yueqiang.Xu@oulu.fi

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Introduction

New and innovative business models have been transforming and disrupting traditional industries at an unprecedented speed (Downes and Nunes, 2014). The energy industry is no exception (Amin, 2011). Traditionally, the industry has a dominant business model with the sole responsibility to generate electricity at central power plants and distribute the energy to end consumers through transmission and distribution networks. This responsibility of delivering power is now being transformed into a dynamic mode of operation due to the deployment of smart meters, the diffusion of renewables and distributed generations, and the development of smart energy applications (Zahedi, 2011).

Smart grid technology enables a shift from the old, centralized production and distribution energy system to a modern network incorporating two-way, end-to-end communication, and decentralized management of generation, transmission and distribution (Xu et al., 2016) (Reuter, Loock, & Cousse, 2019), covering four technological layers, infrastructure/hardware, platforms/data, equipment/devices, and applications/services (Moqaddamerad et al., 2016). The European Union (EU) and the United States (US) define the functions of a smart grid as enabling new products, services, and markets while operating and optimizing assets efficiently (Amin, 2011; Gajic and Eli, 2013). With the advent of smart grids, energy firms have the potential to seize novel business opportunities. What new forms of business models arise for firms in the energy industry is a question of central concern addressed in this paper.

To address that question, we build on the BRIDGE initiative of the Horizon 2020 program, which was launched by the European Commission in 2016. The BRIDGE initiative provides an opportunity to witness novel forms of value creation and of value capture first-hand, as it observes the impact of the technological, commercial, and regulatory transitions that take place in the energy industry at the European level. The program focuses on smart grid and energy storage projects to create a structured view of the innovations and cross-cutting issues that are encountered in the demonstration projects. The energy business model and consumer engagement are two of the four key interest areas addressed in this large-scale initiative, with 31 major Horizon 2020 energy research projects to date (as the time of this research). Through a collaborative review of business models in the energy field, we discover an emerging pattern of new and innovative business models in the energy and smart grid ecosystem: there is a visible shift from product-based business models towards service orientation.

At the same time, Furr (2016) points to similar transitions in a number of digitalized industries such as e-commerce (Amazon), search engine and online advertising (Google), and smart energy (Nest). Hui (2014) differentiates the service-oriented business model from the product-based business, suggesting that new opportunities for value creation and capture emerge which are not limited to physical product sales. Other revenue streams over the customer lifetime become possible after the initial product sale, including value-added services, subscriptions, and apps, which can remarkably exceed the initial purchase price, creating new value for both companies and their customers. Yet, there are inherent tensions between the two business logics, fundamental distinctions between an asset and transaction revenue model, and between differentiation strategy and network-based competitive advantage (Furr, 2016). At a general level, and compared to the classic product business, service-based businesses build on different types of value creation and value capture.

Theoretical research gaps related to the energy and smart grid industry

Through reviewing the extant business model literature, we identified a number of gaps related to business model research in general as well as to energy and smart grids in particular: 1) the lack of a unified explanation about the value created and how such value is captured in the context of industries that transition from product to service businesses. Multiple terms of business models are used (Zott, Amit, and Massa, 2011) without further clarification of what exactly are value creation and value capture, such as Chesbrough's (2007) revenue mechanism, Johnson et al.'s (2008) profit formula, and Osterwalder and Pigneur's (2010) cost structure and revenue streams; 2) the lack of ecosystem thinking when large and complex industries (e.g., the energy sector) require firms to pay attention to ecosystem-level relationships and interactions (Iansiti and Richards, 2006), as value is created by the network of business models co-existing in an ecosystem

(Jansson et al., 2014: 3). The existing business model literature has extensively studied how a focal company creates and captures value for itself, by means of its own operation (Magretta, 2002) or by interactions with external partners (Amit and Zott, 2001; Osterwalder and Pigneur, 2010; Casadesus-Masanell and Ricart, 2011) or by utilizing an extended network (Moore, 1996; Iansiti and Richards, 2006). However, how value is created and captured at the level of an ecosystem (or the systemic value in the energy industry) has rarely been investigated (Xu et al., 2017). Yet at the level of entire ecosystems, new opportunities for value creation emerge that build upon the complementarities among collaborating partners. As such, an enhanced understanding of what these sources of value creation are and how they may be captured is of crucial concern.

Empirical challenges related to the energy and smart grid industry

In particular, and like in a number of other industries, new sources of value creation and value capture emerge as industries shift to a "smart" and digital age. Today's companies fundamentally rethink their business models and logic about value creation and value capture (Hui, 2014), as they seek to take advantage of Information and Communication Technology (ICT). In particular, the inception of the smart grid is an indicator that the energy industry has shifted towards greater digitalization and that information-based competition has come (Wessel et al., 2015). In this new era, the implications for business model innovation are huge. To take advantage of Information and Communication Technology (ICT)-based opportunities, today's companies will need to fundamentally rethink their business models and logic about value creation and value capture (Hui, 2014; Reuter et al., 2019). For instance, in a connected world, products are no longer stand-alone. Over-the-cloud updates enable new features and functionality to be pushed to the connected consumer devices on a regular basis. The products can now be connected with other products, leading to new data and information (Wessel et al., 2015), new services (Hui, 2014; Reuter and Loock, 2017), and new customer experiences (Hokkanen et al., 2016). As stressed by Wessel et al. (2015), despite the inevitability of this "smart" future, most large companies struggle to get the most out of the digital age, such as the amounts of data they have collected through smart meters and sensors or the Internet-of-Things (IoT).

Energy companies are required to recognize and seize the opportunities for new value creation and capture. They need to update the decades-old management mentality and systems to embrace new digital opportunities (Wessel et al., 2015). The shift from the classical energy product and commodity business to greater service-orientation is huge for the traditionally asset-intensive energy companies. Compared to other industries, such as retailing or media, energy firms face new standards as regards customer services. Metering, installation, energy management are just a few examples of service opportunities, through which energy firms have the potential to create novel value going forward.

Empirical case analysis shows that traditional energy players face inherent challenges in making that transition. Key observations are that new and industry-remote players (e.g. telecommunications firms) enter the market in offering innovative energy services. This may be due to the lower asset intensity of the service business and lower barriers to market entry. Moreover, traditional energy players (with energy as commodity business) tend to have a low customer orientation. A shift towards greater service orientation requires energy players to know their customers better, to be able to craft services accordingly. They need to learn how to monetize service with completely new revenue models. As such, new capabilities are required that are by definition remote from the classical energy product business. That said, energy firms do make the transition towards greater service business. Yet, it occurs slowly and with many challenges.

To address the above empirical and theoretical issues and challenges, we utilize the value-based perspective on a business model conceptualization in combination with the layered ICT ecosystem framework to propose and investigate the service-dominant logic and XaaS (Everything as a Service) business model typologies for the energy industry. By doing so, we expand the theoretical and empirical frontiers of business model studies, going beyond the conventional single actor-focused and product-based business models of the industry.

After discussing a number of theoretical and empirical research gaps that surround the conceptualization of the service business model in smart grids in the following section, we identify an essential question for the

transition in the energy industry: "**What types of value creation and value capture opportunities emerge at the level of the ecosystem, as the energy and smart grid industry shift from the existing product-based business model to a greater service orientation?**" To address this research question, we follow a two-stage approach, including an interpretive case study for case analysis and an action research approach for the development of the EaaS framework. Section 4 will present the detailed research methodology.

The rest of the paper is organized as follows. Section 2 presents related literature on the business model, business ecosystem, and service-dominant logic discussion in general. Section 3 provides a discussion on energy and smart grid business models. The research methodology is explained in Section 4. A mapping and aggregated analysis of 51 energy business model cases is given in Section 5 to present key findings of the study, including the identification of four types of Energy as a Service (EaaS) or service-oriented business model typologies in the energy and smart grid ecosystem. Finally, the theoretical and empirical implications arising from the study are discussed in Section 6.

The value-based perspective on the business model and service dominant logic

This section starts with the value-based view on the actor-focused business model and expands to the service dominant logic on the ecosystem and business model.

Understanding business model concepts

The concept of business model has attracted tremendous attention and raised profound debate among scholars concerning how to define and conceptualize the business model (Jensen, 2013). For instance, Chesbrough and Rosenbloom (2002) conceive of business models as focusing devices that explain how economic value could be extracted from a technology or business idea. Morris et al. (2005) define the business model as a set of decision variables that are interconnected to create a sustainable competitive advantage. Other conceptualizations include examples such as an architectural model (Timmers, 1998), a narrative model (Magretta, 2002), a design model (Demil and Lecocq, 2010; Amit and Zott, 2001), a dynamic system (Casadesus-Masanell and Ricart, 2011), and conceptual tools (Osterwalder and Pigneur, 2010; Ahokangas et al., 2014; Lüttgens and Diener, 2016; Martins, Rindova, & Greenbaum, 2015). (Martins, Rindova, & Greenbaum, 2015)

Referring to several studies (Ahokangas and Atkova, 2015; Xu et al., 2016), the origin of business model can be traced back to the business idea: "what a company offers to whom and how" (Normann, 1977). It consisted of components such as resources and competencies, an internal and external organizational structure (Demil and Lecocq, 2010), a customer value proposition (Chesbrough, 2007; Johnson et al., 2008; Zalewska-Kurek et al., 2016), and a cost and revenue structure (Osterwalder and Pigneur, 2010).

Overall, we identify the business model as a boundary-spanning unit referring to value creation and capture, opportunity exploration and exploitation, and company performance improvement and competitive advantage establishment (Chesbrough, 2010; Zott et al., 2011; Onetti et al., 2012; Zott and Amit, 2013; Xu et al., 2017).

Value-based perspective on the business model

The notions of value, value creation and value capture are inherent in the definition of a business model (Lund and Nielsen, 2018) (Reinhold, Reuter, & Bieger, 2011). According to Nielsen and Lund (2015), integrating the aspect of value has tremendously influenced the existing streams of business model studies. One of the common definitions of business model is "the logic of the firm, the way it operates to create and capture value for its stakeholders" (Casadesus-Masanell and Ricart 2010, p. 196). Zott et al. (2010) suggest business model as a construct that conceptualizes the value creation and value capturing of a firm. To go one step further, Hui (2014) defines value creation of the business model as involving the performing activities that increase the value of a company's offering and encourage customer willingness to pay, which is in line with Brandenburger and Stuart's (1996) value-based perspective. Therefore, value is the sum of the firm's profits and consumer surplus (Casadesus-Masanell and Llanes, 2011).

As initially discussed in the strategy research domain, Porter (1996) addresses the importance of a strategic "position" that brings value. Porter (1996) also adopts

a value activity approach to strategy, considering the firm as a cluster of activities responsible for bringing a product to market. These "activity systems" can be designed well or poorly; well-designed systems include activities that are complementary and perform better together than they do individually (Casadesus-Masanell and Zhu, 2013).

Brandenburger and Stuart (1996) coined the term "value-based" strategy, suggesting that value comes from creating "added value" by any actor within the entire value chain or industry. The "added value" from a focal actor is defined as the value created by all the actors in the vertical value chain, deducting the value created by all the other actors except the focal actor in question, as illustrated in Figure 1. The key to value capture (or value appropriation) is the possession of a positive added value. Such positive added value from the firm can be generated from sources that lead to the creation of value asymmetries, including maximizing customer's willingness-to-pay or minimizing opportunity costs of the suppliers, or the combination of both. The accrued value is seen as the wedge between customer's willingness to pay and supplier's willingness to sell (Brandenburger and Stuart, 1996) and how value would be captured as profit.

With regard specifically to value creation, the extant literature builds on Porter's (1996) theory, conceptualizing it as the representation of the activity system including the actions responsible for inbound logistics, operations, outbound logistics, marketing and sales, service, and support activities. These value-adding and re-enforcing activities create value, as each is applied successively to another (Brandenburger and Stuart, 1996; Casadesus-Masanell and Zhu, 2013).

Development in the literature on value capture distinguishes between two essentially different processes (Brandenburger and Stuart, 1996; MacDonald and Ryall, 2004). On the one hand, firms have "bargaining power" that assures them some cut of the value that has been created, which has to do with how much added value they create and how easily they can be replaced. On the other hand, there is a margin of value that goes uncaptured, even after various slices have been allocated to various players. Because creating value is a cooperative process and everyone has a claim to what is left, firms cannot rely on their "bargaining power" to secure a share of these "leftovers"; instead, they must utilize their value-capture ability (Grennan, 2013; Casadesus-Masanell and Zhu, 2013).

Value capture in the business model is the monetization of customer value, the proportion of the value created that is appropriated by the company (Hui, 2014; Casadesus-Masanell and Llanes, 2011). To this end, what embodies value capture in a business model can be Chesbrough's (2007) revenue mechanism or Casadesus-Masanell and Zhu's (2013) profit function. Menychtas et al. (2014) provide a comprehensive view of these elements in the business model: 1) The revenue model, which measures the ability of a company

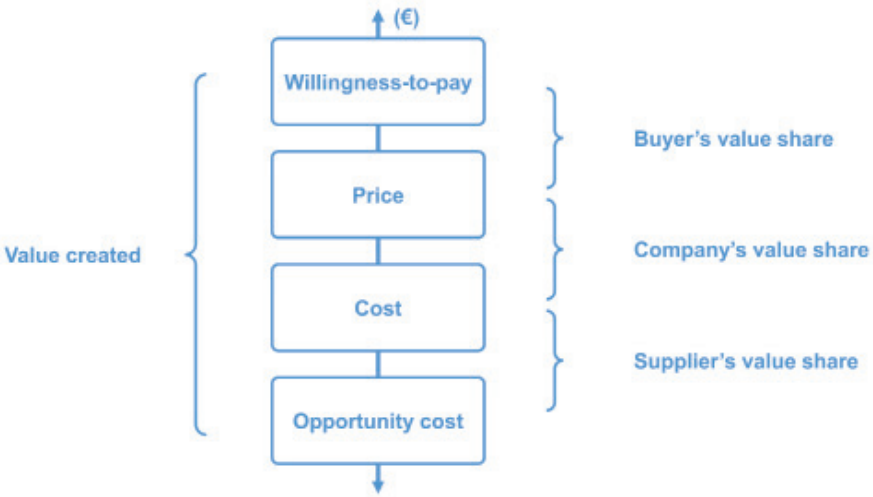


Figure 1: Value creation and the division of value (adapted from Brandenburger and Stuart, 1996).

to translate the value it offers to its customers into money and therefore generates incoming revenue streams (Dubosson-Torbay et al., 2002). 2) The costs structure, which measures all the costs a firm incurs in order to create, commercialize, and deliver value to its customers (Kashef and Altmann, 2012). For instance, directly used products generate costs for their value proposition usage. 3) The profit model, which is the difference between the revenue model and the cost structure (Hamilton, 2004). Thus, the profit model is the revenue that is generated from the revenue model minus the costs that are generated from the cost model (Menychtas et al., 2014).

The rise of business ecosystem thinking

A review of the business model literature shows that the majority of the modern frameworks remain focused on the company level. However, the competitive landscape of modern business has changed to a highly networked economic environment. This is further exacerbated in digitized industries, as digital platforms enable cooperation among complementary firms. In this context, ecosystems and business models within ecosystems are emerging as a new domain of strategy research (Iivari et al., 2016). Moore (1996) defined the concept of the business ecosystem as an economic community of organizations and individuals, including producers, suppliers, competitors, and other stakeholders that produce goods and services that generate value for the customers and users. Iansiti and Richards (2006) describe business ecosystems as highly complex, interdependent, cooperative, competitive, and convolutional in pursuit of innovations.

Importantly, as the unit of analysis shifts from single companies to entire business ecosystems among collaborating companies, classical analyses of value creation and value capture become obsolete. Instead, new approaches are needed that account for the cooperation among complementary firms. In this vein, Amit and Zott's (2001) study on sources of value creation in e-businesses highlights how value is created at the level of transactions among suppliers, partners and customers. Based on a cross-case analysis of e-businesses, they identify efficiency, complementarities, lock-in, and novelty as key value drivers of e-businesses. From this perspective, a business model refers to the design of transaction content, structure, and governance, as it seeks to exploit business opportunities in an ecosystem.

Shifting to the service-dominant logic of the business ecosystem

As the first generation of ecosystem thinking, Moore (1996) presents an individual company-centric view of the business ecosystem (core enterprise, extended enterprise, and ecosystem), where the business ecosystem is created to serve a focal company, or the keystone (Moore, 1996). Jansson et al. (2014) expand the business ecosystem concept towards a more systemic perspective, viewing business ecosystem as a bundle of business models where the interlinked process of value co-creation, co-capture, co-opetition, and co-evolution prevails, conceptualizing the ecosystem as a network of individual business models. A true systemic view of a business ecosystem and an associated ecosystemic business model is proposed by Vargo and Lusch (2016) in recent marketing literature, highlighting not only the importance of systemic and institutional perspectives but also their convergence. The concept of the service ecosystem describes a business ecosystem as "a relatively self-contained, self-adjusting system of resource integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Vargo and Lusch, 2016, p. 10-11). Zalewska-Kurek et al. (2016) further argue that customers are essential to developing the core element of the business model, and they should not be viewed just as an audience but as a valuable "actor."

Utilizing Gummesson's (2011) dynamism argument, service ecosystem scholars (Wieland et al., 2017) replace labels such as buyers and sellers and refer only to actors interacting with other actors. Similarly, adopting this actor-to-actor perspective, the service-dominant logic researchers suggest all ecosystem actors, such as end users and firms who engage in exchange, are integrating resources and exchanging services to achieve value co-creation. While the network perspective of the business ecosystem and business model recognizes the importance of collaboration among companies, this view is still wrapped around the focal company and overlooks the systemic participation of actors in the dynamic value co-creation among actors.

Instead, the service ecosystem perspective sees the shift from company-centricity and the sole production of outputs to activities and processes in which ecosystem actors participate in service exchange (Vargo and Lusch, 2016). A service ecosystem is also aligned with

Brandenburger and Stuart's (1996) value-based strategy, in the way that the institutionalization of the new norm and value increases consumer's willingness-to-pay (or willingness to engage in exchange) in the ecosystem, while actors' (companies') opportunity costs are reduced, thanks to the co-creation activities and shared access to resources within the ecosystem.

Smart grid ecosystemic business model

Prior to introducing the service-dominant logic and service ecosystem view to energy and smart grids, Xu et al. (2016) identify that when analyzing the transition of the utility-led centralized energy system to a distributed smart grid system, the traditional company-centric business model conceptualization and tools do not suit the purpose. On the other hand, this research gap is rarely studied in the business model literature or addressed in energy-related studies. Xu et al. (2016) systemically study the categories of value that can be created and delivered by the adoption of a smart grid in today's energy system, suggesting that the use of the ecosystemic business model in the smart grid domain can unlock and create five types of value in the energy ecosystem and society in general.

The categories of value include economic (e.g., reducing unnecessary cost and investment in constructing backup generation capacity), environmental (e.g., facilitating the integration of renewables), reliability (e.g., the use of next-generation ICT technologies to improve network reliability), energy security (e.g., ramping up renewables to reduce reliance on depleting fossil fuel resources), and consumer engagement and interaction (e.g., turning consumers into prosumers, facilitating active market participation). The discussion of how these categories of value are created with a smart grid ecosystemic business model is presented in the following sections 3.1 and 3.2.

The 4C ecosystemic business model for smart grids

Incorporating the service ecosystem logic for this study, we first adopt a typological 4C framework (Wirtz et al., 2010) that is used to study ICT-enabled digital ecosystems such as 5G (Yrjölä et al., 2015) and smart grids (Xu et al., 2016, 2017).

One reason behind the utilization of the 4C ecosystemic model is related to Vargo and Lusch's (2016) service ecosystem thinking, showing that the transition of smart grid is a performative process, in which business models, technologies, and markets are developed and continually shaped by a broad range of actors influencing the value creation and capture practices. In this circumstance, business models cannot be studied in isolation. The separation of a business model from its technological and economic context is less suited for investigating the interdependence of the companies and actors that are evolving in the same business ecosystem (Alanne and Saari, 2006), as in the case of smart grids.

The 4C framework consists of four essential business models, each with different value propositions and revenue mechanisms: connection, content, context, and commerce (Table 1). Yrjölä et al. (2015) suggest a key characteristic of the 4C framework is that the upper layers can be enabled by lower layers in an ICT ecosystem. Four typological value propositions (value of connection, value of content, value of context, and value of commerce) are utilized to describe the value structure of the business ecosystem. The value embedded in the value propositions can be created and captured in individual layers, multiple layers, and combinations of different layers (Yrjölä et al., 2015; Xu et al., 2016, 2017), which can be seen as "value-in-layers" with the main value in certain layers and the enabling value in other layers. The detailed demonstration and adaptation of the 4C framework in the energy industry and smart grids are presented in Section 5.1.

Layer	Description
Commerce	Service providers offer all stakeholders an application or marketplace for trading alternative connectivity solutions, content, or context data.
Context	Service providers offer data and information-related context services.
Content	Service providers offer any content the customers would want or need.
Connection	Service providers offer connectivity solutions to one or several networks.

Table 1: The 4C ecosystemic business model and value framework (adapted from Wirtz et al., 2010; Xu et al., 2016, 2017; Moqaddamerad et al., 2017).

Moreover, to illustrate the different types of value that may be related to ecosystem thinking, this paper utilizes Xu et al.'s (2016) study of multiple value streams to be recognized and realized in the context of the energy industry and smart grids. Referring to Xu et al. (2016), business models need to create not just economic value, but also environmental value, reliability value, energy security value, and consumer engagement/interaction value in the energy ecosystem.

XaaS service business model typologies

In the traditional product business, creating value is associated with identifying enduring customer needs and manufacturing well-engineered solutions. The competition was primarily feature-versus-feature warfare. When product feature improvement and innovation become too incremental, price competition arises and eventually makes the product obsolete. In contrast, the service business is seen to create continuous value or multiple revenue streams rather than sales of the product (Hui, 2014). In the digital services domain, the notion of XaaS (Everything as a Service) gains popularity for digitally enabled systems (Lenk et al., 2009). In this direction, a large number of digital service providers can be identified to offer a variety of cloud-based services across the cloud stack layers. According to Mell and Grance's (2011) model, the most widely accepted digital service models are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). Various characteristics, such as virtualization of hardware, rapid service provisioning, scalability, elasticity, accounting granularity, and cost allocation models, enable the proliferation of XaaS, and the notion of XaaS (SaaS, PaaS, and IaaS) is completely changing the way software is produced, consumed, and distributed. Consumers do not buy licenses for software products anymore; they pay for its usage on a pay-per-use basis (Giessmann and Stanoevska-Slabeva, 2013).

The SaaS layer is the most visible service of cloud computing, which makes software applications accessed directly by the end users (Stanoevska-Slabeva and Wozniak, 2009). These applications are deployed and executed in cloud systems and can be accessed from various client devices through a client interface such as a Web browser (Mell and Grance, 2011). The IaaS layer offers computing resources such as processing, storage, networks, and other fundamental computing resources that can be obtained as a service (Mell and Grance, 2011). Connecting the IaaS and SaaS layers, the PaaS layer is a Web-based development platform which is open to external developers for new component and application development (Giessmann and Stanoevska-Slabeva, 2013).

The pricing model of XaaS is classified into four categories by Menychtas et al. (2014) as (1) Subscription: Customer pays for a time frame during which the product can be used; (2) Pay-Per-Use Event: Customer pays for the event of interaction with the service; (3) Pay-Per-Use Time: Customer pays for the time (duration) of the actual interaction with the service; (4) Pay-Per-Use Quantity: Customer pays for the quantity of resources consumed by interacting with the service.

To conclude the above discussion in Section 3.1 and Section 3.2, we see that XaaS represents a holistic view to digital service architecture, which is embodied in three digital service business model typologies (SaaS, PaaS, and IaaS). By combining XaaS service business model typologies and the 4C ecosystemic framework, we conduct mapping and analysis of the innovative business model cases identified by experts from the EU BRIDGE initiative.

Research design and data collection

This study follows the methodology of the interpretive case study (Walsham, 2006; Andrade, 2009; Bhattacharya, 2012) to analyze the energy business cases in the first stage and action research to construct the EaaS framework in the second stage. The study is carried out as the joint research work of two EU-level energy innovation research projects. One project studies the peer-to-peer technical platform that facilitates decentralized energy market design and the peer-to-peer energy exchange of smart grid, while the other develops a local marketplace and innovative business models to encourage micro-generation and the active participation of prosumers to exploit the flexibility created for the benefit of connected local grids.

In the first stage, the study embarks on a systematic analysis of 51 innovative business cases that have launched new business models. Based on the

theoretical background previously outlined, the cases are analyzed and mapped in the proposed 4C framework and in the XaaS typology in order to address our research question posed at the outset. This approach enables us to gain insight into what types of value are created in smart grid ecosystems and the related business model typologies in the energy and smart grid industry. Some succeeded in radically changing the industry.

In the second stage, the study takes an action-oriented approach (Eden and Huxham, 2006; Koshy et al., 2011) to construct the Energy-as-a-Service logic through the XaaS typology. The emphasis is on the use of a service-dominant logic. According to Bahari et al. (2015), action research methodology in management science leads to producing scientific knowledge that can serve the action; and it enables the formalization and contextualization of models and tools, leading to new knowledge capable of facilitating organizational change.

The data is collected from the BRIDGE initiative of the European Commission, a collaborative initiative for major European smart grid and energy storage projects, of which 15 projects contributed energy business cases to BRIDGE's Business Model Working Group. The data is retrieved in the form of business model cases, which are provided by a wide range of energy experts, business enterprises, policymakers, and research institutions with expertise and knowledge of the smart grid and energy landscape internationally. The study includes a total of 34 business model cases from the BRIDGE program and is further complemented by 16 cases from the two Horizon 2020 projects that are both participating in the BRIDGE and have authored this paper. The cases cover a wide spectrum of the smart grid ecosystem, including distribution network, aggregation platform, virtual power plant, energy storage, smart home service, trading platform, and blockchain-enabled energy solutions.

Overall, the data utilized in the research is provided by the aforementioned parties and participants in 2016 and 2017, which ensures a timely study and analysis of the state-of-the-art business models in energy and smart grids. In the next section, we present the key takeaways from our research and suggest how they can help innovators transform the energy industry.

Findings and Discussion

This section presents the results of the study with the proposition of the EaaS ecosystemic framework.

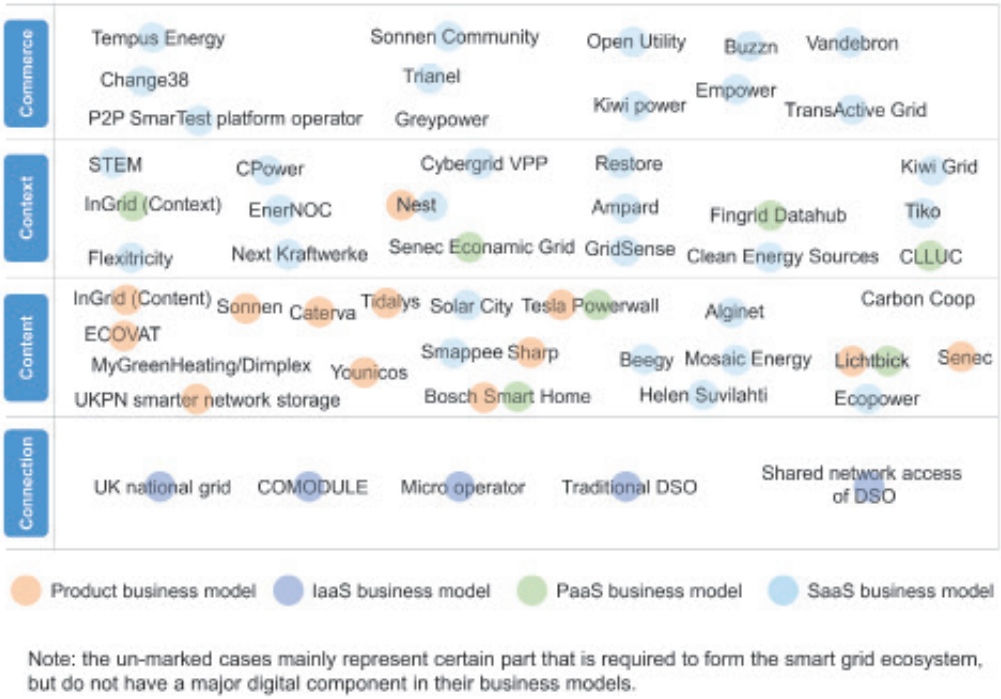
Mapping of business models in the 4C ecosystemic framework

By mapping a range of successful business cases in the proposed 4C framework and in the XaaS typology, we could gain insight into what types of value are created in smart grid ecosystems. The emphasis has been on the value that is created from a service-dominant-logic standpoint and the related business model typologies (Figure 2). The four layers of connection, content, context, and commerce are organized into four verticals. It is necessary to note that the unmarked cases mainly represent a certain part that is required to form the smart grid ecosystem but does not have a major digital component in their business models.

Connection is the first layer in the 4C ecosystemic framework. The role of a connection business in smart grids is to build and manage facilities for massive network operations. The imperatives of the infrastructure business are about economies of scale, creating the value of reliability, and security. Connection business models are traditionally operated by the energy network operators, such as distribution system operators (DSOs), who focus on delivering electricity at lower cost and satisfactory power reliability. The UK national grid is an example of a DSO that manages private distribution grids, providing grid-scale storage and offering commercial maintenance services.

The content layer presents the value propositions that focus on power quality, renewable energy integration, and consumption feedback. Balancing energy supply and network constraints is a prime focus; thus the businesses in this layer exhibit more collaborative behavior. There are product-based companies such as Caterva, a German startup that offers batteries to residential customers directly through selling or renting. There are also product-service hybrid companies like the US-based SolarCity (developing turnkey solutions for residential solar panels and providing on-going support services).

On top of the content layer, the contextual value is created and captured in the "context" layer. Flexibility is the primary value, thus requiring coordinated activities among



Note: the un-marked cases mainly represent certain part that is required to form the smart grid ecosystem, but do not have a major digital component in their business models.

Figure 2: Mapping of energy business models in the 4C ecosystemic framework.

the ecosystem actors. Here, the context-related value is refined to fit specific use cases, such as flexibility forecast and network load feedback (Xu et al., 2016) (Helms, Loock, & Bohnsack, 2016). The main offerings in this layer are usually the efficiency and flexibility services. Energy aggregator is a viable business model that optimizing energy consumption at the customer site while providing customers with energy management tools such as energy monitoring, peak control, and demand response (DR). InGrid is another context business case that builds a technical platform to facilitate the integration of renewables and distributed generation (DG) in the main power grids.

Data has been identified as playing a critical role in the context layer; and firms employ different approaches to keep data accrued in their operations in closed, partially open, or fully open manners. For instance, Restore is an aggregator of industrial and commercial energy customers, who partially opens its data to allow grid operators to tap into its customers' reserve, providing a balancing service for the grid operators while rewarding the flexibility providers.

In the commerce layer, open energy trading platforms are emerging. Trading service providers, such as Vandebron, Empower and Open Utility, allow the participation of smaller customers having restricted access and participation in the energy market due to regulatory barriers. For instance, Vandebron enables small-scale renewable energy producers to trade green energy directly with end customers. Yet, the actual operation of open energy trading platforms are still limited due to regulatory restrictions (Loock, Reuter, & Cousse, 2017; Loock, Reuter, & vanderTann, 2016).

It is worth noting that in the content and context layers, there are a few business cases that involve creating both content and context value due to their unique business models. For instance, InGrid does not only produce hardware and storage systems for renewable integration in the smart grids, but also develops software solutions to help manage the power grids in different contexts. InGrid's business model covers both content business and context business. In this case, we give InGrid a unique identifier for each layer and map the case, as does InGrid (content) for its content business and InGrid (context) for its context business, in order to support a more granular analysis of how XaaS business models can be applied to each individual value unit or value proposition in an integrated business model.

The Table 2 below summarizes the five value categories (name) identified and mapped across the four 4C ecosystemic layers.

Economic value		Categories of value in the smart grid ecosystem				
		Environmental value	Reliability value	Energy security value	Engagement/ Interaction value	
Value related to the 4C ecosystemic layers	Commerce-related value	Enabling prosumers to participate in energy market and trading	Enabling the trade of small-scale renewables			Lowering barriers for end customers to interact with the energy producers
	Context-related value	Reducing economic costs arising from network constraints	Enhanced use of renewables and distributed generation	Reliability stemming from forecasting and providing flexibility to the grid		Customer engagement and interaction in smart grids
	Content-related value		Integrating different renewables	Power quality		Feedback on energy consumption
	Connection-related value	Economies of scale to provide economic benefits		Network reliability	Security of energy supply and the energy network	

Table 2: The mapping of the value categories across the 4C ecosystemic layers.

From XaaS to EaaS: service business typologies in a smart grid ecosystem

After the mapping and analysis of energy business model cases in the 4C ecosystemic framework, the research moves on to aggregate the business cases and construct a service-oriented framework at a higher abstract level with the three business model typologies of XaaS. We identify how an energy and smart grid ecosystem is shifting to a service-dominant logic with service-oriented business models. By adapting to the XaaS logic, we propose four Electricity as a Service (EaaS) business model types (Figure 3). Generally speaking, the EaaS business models follow the 4C ecosystemic framework's "value-in-layers" structure, in which there are main value layers and the enabling value layer. The enabling value layer is usually the connection layer at the bottom of the framework as a foundation of the digital ecosystem. However, depending on the case, other layers can also become such layers to enable the main value creation and capture.

First, the connection business is very similar to the IaaS business typology. In smart grids, the incumbent DSOs have adopted the service business model by building and maintaining an electricity network to enable the delivery of energy through the electrical network at different voltage levels. These DSOs charge a network usage fee, capturing value through a subscription-based pricing mechanism that is often regulated by regulators and policymakers. Depending on the regulation, such pricing is either incorporated into a single energy bill or a separate network usage bill (such as in Finland) for consumers. However, it is important to stress that such a DSO model is mainly applicable in liberalized markets such as the EU, Australia, New Zealand, and some states in the US. In other countries and regions, the integrated utility business model remains dominant, where DSO is an integrated function in the entire utility operation, from electricity generation to transmission and distribution and to retail. In the case of an integrated utility business model, product-oriented logic is still being utilized, as both energy costs and network costs are aggregated in the final energy bill.

The emerging concept of Shared Network Access (SNA) for DSOs (Li et al., 2016) shows further servitization

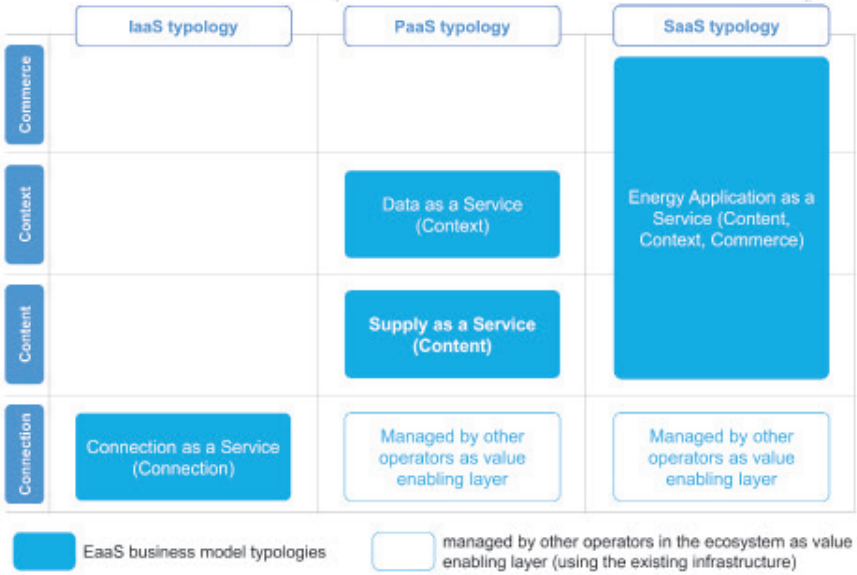


Figure 3: EaaS business model typologies.

potential for the connection business. Essentially, SNA is a business model that incentivizes the incumbent DSOs to give up its exclusive access to the network asset and operations, leasing the spare and under-utilized capacity to licensed independent third parties. The ownership of assets is retained by the incumbent DSO, while competition is introduced in the operation of the spare capacity. The new secondary DSOs can introduce new service offerings and create more value without having to own the physical energy distribution network, thus becoming a provider of "Connection as a Service" that enables universal accessibility.

Second, we identify that the content and context business models resemble the PaaS typology and can be analyzed in two sub-categories (content business and context business). The content business is primarily focused on building physical platforms on top of the energy infrastructure to facilitate the energy supply that flows in the electrical grid. Such a business model is built upon the existing grid infrastructure to be able to create and capture value, that is to say, the core of such a business model is about combining the grid infrastructure operated by DSOs with an energy supply infrastructure. The examples can be the renewable energy aggregators or the energy storage networks operators such as InGrid, Senec, and Lichtblick. These companies manage network energy generation or storage facilities coupled with ICT technologies to facilitate the ever-increasing supply of distributed energy resources such as solar and wind generations. These business models operate as different platforms to co-create value for the energy ecosystem while competing with each other, since they all fully or partially develop proprietary storage and control technologies that are only compatible if new applications are developed according to their technical standards and specifications. The use cases such as InGrid's flexibility and renewable dispatch service in the context layer, Senec's grid platform, and Lichtblick's SchwarmEnergie all illustrate how these physically oriented platforms can enable new applications. Furthermore, it is evident that all of these physical platforms represent the shift from product-based logic to service-oriented logic in the energy industry, in other words, from microgeneration and energy storage product vendors to platform operators. Well-known players such as SolarCity are adopting service-oriented logic as well. For instance, SolarCity introduces a "zero up-front investment" model for home solar PV and focuses on the maintenance and support service contract to generate cash flow in the long run. All of these content business models are moving towards a "Supply as a Service" logic instead of strictly sales of products and equipment. Within the Empower project, a large-scale survey of customers in Norway, Switzerland, Spain and Germany uncovered customers' interest in energy-related services (Reuter and Loock, 2017).

Another type of PaaS is developed out of the software and data platforms in contrast to the aforementioned physical platforms. Thanks to increasing digitalization in the energy industry, such as the mandated rollout of smart meters in the EU, massive data is captured using ICT technologies, enabling and facilitating the emergence of context services. For example, CLLUC as a software platform developer creates a blockchain platform to remove intermediaries and improve operational efficiency for a number of industries, such as energy and finance (Xu et al., 2017). The platform allows customers and third parties to collaborate and develop new solutions and offerings through its software platform to enable grid flexibility and consumption reporting services. Fingrid's data hub is another example. The open data hub is a subsidiary of Fingrid, the Finnish transmission system operator. This system operator manages the open data hub and provides Finnish energy ecosystem actors with open access to retail electricity and consumption data. By establishing an open platform with "Data as a Service," new smart energy applications and services are expected to be developed, allowing energy ecosystem actors to create and capture new value.

Third, we discover that the SaaS business model typology can find real-life applications in the content, context, and commerce layers. Altogether, we address these applications as "Energy Application as a Service." Vandebron and Open Utility are remarkably new business models that offer commercial service applications. Vandebron operates an "Airbnb-like" open renewable marketplace for smaller generators and prosumers to trade their renewable energy directly to the end consumers. The marketplace itself is not an entity that involves energy trading, but rather empowers a peer-to-peer energy exchange with others. It can be considered as a software-enabled e-commerce application that is built on top of the physical and software infrastructures (e.g., connection, content). Empower is also a similar case within this typology.

Virtual Power Plant (VPP) as an emerging new business model in the energy ecosystem can be categorized within the SaaS typology. Shabanzadeh et al. (2016) suggest that VPP is a cloud-based software control center that takes advantage of ICT and Internet of Things (IoT) devices to aggregate the capacity of heterogeneous energy resources including different types of DG units, energy storage systems, and flexible loads to form an energy resource pooling with the key purpose of providing ancillary services for system operators such as DSOs. VPPs, such as Next Kraftwerke, provide a network balancing service based on contextual data and information, which can be considered as a stand-alone service application in the context layer. Energy service applications can also be found in the content layer. For instance, Helsinki Energia's (Helen's) Suvilahti solar project is a service business model. On the one hand, it allows residential consumers to own and invest in shares of solar generation in a central and optimal location to maximize return on investment and create value for the utility's customers. On the other hand, Helen charges a monthly service fee for managing solar generation on behalf of its customers, shifting from sales of green energy to the provision of renewable energy services.

The ecosystem actors may collaborate on either the value creation side or the value capture side. In the case of smart grids, DSOs and mobile network operators (MNOs) may jointly create a network load feedback service and provide it to aggregators and consumers/prosumers. On the other hand, consumers/prosumers may allow behavioral data to be stored and utilized by DSOs and MNOs, while the true value of such data is captured by aggregators. The aggregators can provide Data as a Service (DaaS) that renders flexibility forecasting service to the network operators (like DSOs) or provides consumption and usage behavioral analytics to enable energy retailers to gain a better insight into user behavior, which in return facilitates more value-added services to be created for the consumers/prosumers. Furthermore, in the case of smart grid DR, VPP operators like cyberGrid can co-create value with consumers and prosumers to provide balancing service to the electric distribution network, benefiting network operators with the value of reliability and security. VPP operators will share the profit with prosumers and consumers by means of monetary rewards or the economic and environmental value. In this way, all parties can create and capture multiple streams of value all together for the ecosystem, which is in line with Vargo and Lusch' (2016) service ecosystem logic.

Conclusion and implications

Generally, the paper shows that Vargo and Lusch's (2016) service ecosystem view can be applied to the energy ecosystem through the 4C ecosystemic framework. In this setting, Vargo and Lusch's (2016) mutual value creation through service exchange is identified as such that different layers within the 4C ecosystem can create value and service offerings that can later enable new types of value and service offerings in other layers of the ecosystem.

Based on Yrjölä et al.'s (2015) suggestion for the ecosystemic perspective, the 4C typologies are placed as layers where businesses on lower layers are required as enabler and value levers for higher layers to exist. The different stakeholders or actors within the ecosystem can offer businesses alone or as bundled value creation, and the business potential of the entire ecosystem depends on the ecosystem actors' synergy when providing their services to other actors within the ecosystem.

To sum up, an important finding from the paper is related to whether the digitalized energy ecosystem leads to the formation of XaaS, the well-known system design and architecture typology in software and digital business. The research shows that there is a two-way interplay. For instance, Vargo and Lusch's (2016) service ecosystem concept explains that the institutional frictions within the energy industry provide the impetus for the digitalization of the energy industry, the uptake of digitalization of energy industry, and the development of smart grid technologies and innovations. On the other hand, the XaaS concept that is adopted by innovative (digital) energy companies stimulates and steers the industry towards a service-oriented ecosystem, since the collaborative value creation and capture approach enables the companies to tap into new business territories that would not be possible if all actors adopt a closed business mind set (as the aggregator and VPP cases discussed in Section 5 of the paper).

Research implications

The academic contribution of the study is the proposition of a service-dominant logic for the business model and ecosystem research to complement the existing value-based perspective (value creation and value capture) in business model studies. For the first time, the study introduces the XaaS service business model typologies that are widely known in the ICT research domain to the energy sector and investigates how the three service-oriented business model types can be used to enable and facilitate the digitalized transition of the energy industry and smart grids in particular.

The paper studies the service-dominant logic of the energy industry through the investigation of innovative business cases collected by the energy experts from the EU BRIDGE initiative. Through the 4C ecosystemic framework, the paper is able to identify and categorize how these business cases can be recognized and placed in different layers of the energy ecosystem. Then the action research and utilization of the XaaS concept and typology constructs the service ecosystem framework for the digitalized energy business models. Building on these concepts and frameworks, the paper demonstrates how innovative businesses can provide different energy services create value that cross multiple layers of the energy ecosystem with the engagement and involvement of different energy industry actors. Thus, it goes beyond the conventional utility-centric and product-based business model of the energy industry, emphasizing the maximization of ecosystemic value for actors involved in a business ecosystem, in contrast to the conventional wisdom on value maximization for a focal actor of the business ecosystem. As argued by Wieland et al. (2017), this is an issue regarding the unsatisfactory definitions and normative prescriptions of the business model in the extant literature, due to the many researchers adopting the concept with ease. When a scholar or practitioner frames a business model in a dyadic transfer of value for money, this individual is likely to view the value creation, value capture, and value exchange practices with a rather static value. In contrast, when an actor's business model frames the actions of the firms, customers, and other ecosystem actors in a collaborative manner, this actor is likely to actively engage in business model development with a broad range of stakeholders and seek the maximization of mutual benefit and value in the ecosystem. This is suggested as an important step in the further exploration of business models and business model development in a systemic and dynamic context (Wieland et al., 2017).

The utilization of XaaS typology and the 4C ecosystemic framework in an energy ecosystem setting demonstrates

evidence that a more general digitalization framework such as XaaS can be used to study conventional industries that have been digitalized or are undergoing the process of digitalization. On the one hand, this study shows that the XaaS typology is a phenomenological business model classification tool for digital business across different sectors (the focal section of this paper is energy). On the other hand, it is necessary to apply or further develop the framework with adaptive thinking: one should not take such a digitalization framework without thinking critically and adapting to the specific context, such as industry, market, or regulation. That is to say, the EaaS framework is an adaptation of the original XaaS typology by taking into account the ecosystem characteristics of the energy industry.

Furthermore, this study derives its findings from the analysis of the real-life business model cases identified by experts from 15 of the EU major energy projects through a collaboration with two Horizon 2020 energy research and innovation projects, providing a solid ground supported by empirical data for business model conceptualization on a large scale.

Practical implications

The study's practical implications relate to the possibility of analyzing the smart grid business models with XaaS and service-oriented logic. The study proposes a new paradigm for energy companies and policymakers to examine the business potential of a future energy and smart grid ecosystem without having to dwell on the old product-based logic, enabling new value creation and capture in the energy industry, as addressed by high-level government bodies such as the EU.

The novelty of the research relates to the proposing of XaaS typologies for the energy industry, including infrastructure-oriented XaaS, or Connection as a Service (CaaS); platform-oriented XaaS, or Supply as a Service (SaaS) and Data as a Service (DaaS); and application-oriented XaaS, or Energy Application as a Service (EAaaS). These typologies as a whole are considered as EaaS. With these new digital service business typologies and the concept of EaaS, we aim to propose and evangelize a service-oriented mind set for the practitioners and actors in the energy ecosystem to innovatively create and capture new value arising in the smart grid era.

Furthermore, the study presents the insight for energy companies and practitioners to explore new avenues of creating and capturing value in service business territories and exploit new growth opportunities arising from the service-oriented transition of the energy industry. Reverting to the first section of the paper, we call for an update of the management mind-set for business executives and practitioners in this digitalized and connected era.

At last, the mapping of the business model cases shows that a number of product-based companies utilize a product-service hybrid model, stacking a service application layer on top of its product business. We recommend further research to study the role of hybrid business models in the business ecosystem: how they create and capture value and contribute to the broader context of industry transition and service digitalization.

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Appendix

Layer	Companies / business cases included in the study
Commerce	Tempus Energy, Sonnen Community, Open Utility, Vandebron, Change38, Trianel, Buzzn, P2P SmarTest platform operator, Greypower, Kiwi power, TransActive Grid, Empower
Context	STEM, CPower, Cybergrid VPP, Restore, Kiwi Grid, InGrid (Context), EnerNOC, Nest, Ampard, Fingrid Datahub, Tiko, Flexitricity, Next Kraftwerke, Senec Econamic Grid, GridSense, Clean Energy Sources, CLLUC
Content	InGrid (Content), ECOVAT, MyGreenHeating/Dimplex, UKPN smarter network storage, Sonnen, Caterva, Younicos, Tidalys, Solar City, Smappee, Bosch Smart Home, Sharp, Tesla Powerwall, Alginet, Carbon Coop, Beegy, Mosaic Energy, Helen Suvilahti, Lichtbick, Senec, Ecopower
Connection	UK national grid, COMODULE, Micro operator, Traditional DSO, Shared network access of DSO

About the Authors

Yueqiang Xu is a project researcher and PhD candidate at Martti Ahtisaari Institute, the University of Oulu, Finland. His research areas include smart grid, digitalization of energy and other ICT related domains. His professional experience in energy industry includes conducting research and consulting projects for energy utilities, ICT and smart grid solution providers as well as regulatory organizations, for example, the World Energy Council, Microsoft, EDF (France), ABB (Global), ADEME (France), Australian Renewable Energy Agency (Australia), BEAMA (UK), Dong Energy (Denmark), Opower (USA) and the European Union.

Dr. Petri Ahokangas is senior research fellow and leader of FUTURALIS research group at Martti Ahtisaari Institute of Oulu Business School at the University of Oulu, Finland. FUTURALIS focuses on future digital businesses models and ecosystems. He is also adjunct professor of international software entrepreneurship at the University of Oulu. His research interests are in how innovation and technological change affect international business creation, transformation, and strategies in highly technology-intensive or software-intensive business domains. He is co-editor-in chief of Journal or Business Models, and he has over 140 publications in scientific journals, books, conference proceedings, and other reports. He is actively working in several ICT-focused research consortia leading the business research activities. Prior to his academic career, he worked in the telecommunications software industry. He is also a serial entrepreneur and active consultant in the field on digitalization, strategy and internationalization.

Emmanuelle Reuter (Dr. oec. HSG) is an assistant professor of innovation management at the University of Neuchâtel, Switzerland. She received her PhD in management from the University of St. Gallen, Switzerland. Her research focus lies at the intersection of innovation, strategic management, organization theory and sustainability. She specifically investigates into the underpinnings of strategic, organizational, institutional and social innovation, with a particular emphasis on the role of individuals, the cognitive and cultural dynamics in creating and inhibiting change. She consulted regularly and published reports on the private banking and electric utilities' industries, which served as empirical contexts of study.

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Business Model Development: A Customer-Oriented Perspective

Bernd W. Wirtz [1] and Peter Daiser [2]

Abstract

Purpose: This study provides a business model development framework that explicitly focuses on the customer as well as integrating customer knowledge into the development process for enhanced value creation. The proposed framework shall enhance our understanding about this phenomenon and present a helpful guidance for researchers and practitioners.

Design/Methodology/Approach: The study follows a conceptual approach that is based on insights from prevailing literature. The deduced findings are illustrated with supplementary context from a prominent case study.

Findings: The findings underline the importance of customer-orientation for successful business model development. Furthermore, business model development should follow an actively managed, systematic approach that takes into account distinctive customer groups, business model change intensity, and business model development types. The presented framework provides fruitful avenues for future research and valuable guidance for management.

Practical Implications: The presented framework provides managers with a tool to plan and organize their business model development process.

Research limitations: Given the vast amount of academic journals, it is unlikely that every applicable scientific publication is included in the analysis. The illustrative example is descriptive in nature, and thus, does not possess empirical validity.

Originality/Value: The main contribution of the study is the explicit transfer of important aspects of the market orientation literature to the business model development phenomena and the strict integration of the customer into the associated process. Thus, this study provides a customer-oriented framework on business model development that supports the field's conceptual progress. Furthermore, the study supports the normative debate in the business model literature.

Keywords: Business model; customer; innovation; development; framework

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1 German University of Administrative Sciences Speyer, Chair for Information and Communication Management, Freiherr-vom-Stein-Str. 2, 67346 Speyer, Germany, ls-wirtz@uni-speyer.de

2 Professorship in E-Government and Digital Transformation at the Municipal University of Administration in Lower Saxony, peter.daiser@nsi-hsvn.de

Introduction

In 1954, Drucker (1954, p. 37) stated that "it is the customer who determines what a business is". Since that time, customer perspectives have become vital concepts in many scientific disciplines. The customer also plays an important role in the business model field (Foss and Saebi, 2016; Osterwalder et al., 2010; Wirtz et al., 2016b), which, for instance, emphasizes the importance of customer value creation (cf. Amit and Zott, 2001; Rhoads, 2015; Teece, 2010). Furthermore, the creation and development of business models strongly depends on the customer, who can be an important contributor for business evolution and innovation (Johnsen et al., 2006; Öberg, 2010; Thomke and Hippel, 2002). In particular, when exploring "the business model concept through the lenses of organization design and strategy, [...] the focus on customers and the ability to create value for a customer plays a major role in delineating of the business model construct" (Rhoads, 2015, p. 39). From this perspective, the customers can be seen as a vital source of strategic input (Buur and Matthews, 2008; Hippel, 1986; Prahalad and Ramaswamy, 2000) that needs to be considered to keep them satisfied and to provide lasting superior value (Hienerth et al., 2011; Pynnönen et al., 2012).

Considering the necessity for constant business model development (BMD), it is remarkable that there are many open research issues on how business models evolve (Foss and Saebi, 2016; Spieth et al., 2014; Wirtz et al., 2016a). In particular, when looking at the results of our literature review, we noted a lack of business model frameworks that consistently connect a company's customer base with the required BMD. This shortcoming has also been detected in recent publications on business model innovation, in which the authors, for example, assert that "despite the many good attempts to define business models, there are a limited number of frameworks that are capable of taking customer-driven change into account" (Pynnönen et al., 2012, p. 5), express a shortcoming of comprehensive frameworks that support managers in innovating their business models (Frankenberger et al., 2013), or criticize a lack of concepts that present "an integrated customer-driven BMI framework" (Wirtz et al., 2016a, p. 14).

Given the importance of the customer for BMD and the finding of Rhoads (2015, p. 39) that "most management research on business models does not specifically address the overlap with customer marketing focused research", we see a great need for research concerning customer-oriented business model development (COBMD). This argumentation is reinforced by a recent call for papers of the Academy of Marketing Science, in which the authors also expect to provide an impetus for research concerning a customer-centric perspective on business model development (Gatignon et al., 2016). Therefore, this study tries to develop a COBMD framework—in the form of an abstract representation of vital elements of the BMD concept within a structural frame displaying their theoretical connections—that explicitly puts the focus on the customer, and thus, supports integrating customer knowledge into the BMD process and tailoring the BMD to the customers' needs and preferences for enhanced creation of value with customers (Prahalad and Ramaswamy, 2004).

Apart from that, several researchers claim that—given the high but dispersed amount of knowledge available (Carayannis et al., 2015; Schneider and Spieth, 2013; Wirtz and Daiser, 2017)—there is also a need for a normative approach to create a common understanding and a common language of important BMI concepts (cf. Bocken et al., 2014; Massa and Tucci, 2014; Wirtz et al., 2016a) since this would support a faster and more sustainable development of the field (Bocken et al., 2015). By its very nature, the COBMD framework also contributes to this debate since a conceptual framework adds to the common understanding of a topic by classifying existing knowledge and integrating it into a unified concept (cf. Lambert, 2015; Taran et al., 2015). From a practical perspective, this study intends to support business model management by presenting vital BMD elements and demonstrating their conceptual connections.

Since the conducted review of existing scientific literature could not clarify what a COBMD framework looks like, we aim to develop such a framework. This exploratory study addresses this challenge by drawing from scientific literature and complementing the deduced findings with an illustrative example. Thus, we follow a conceptual descriptive approach, which seeks to guide academics and practitioners on how to assess the relevant aspects of COBMD and on how to strategically integrate the customer perspective into this concept.

To achieve the previously mentioned goals, the article proceeds as follows: After a brief outline of the conceptual background of the study, we present the state of research on COBMD frameworks. As the scientific literature on this subject is sparse, we went on to develop the framework by integrating knowledge from related fields, in particular from the market orientation literature. Having deduced the COBMD framework, we use Google as an illustrative example since this company conducted numerous successful BMD during the past two decades (Goggin, 2012; Steiber and Alänge, 2013; Wirtz, 2016). The article concludes by presenting the associated findings, implications, and takeaways for academics and business model managers.

Conceptual Perspective

From a scientific research stream perspective, this study builds upon market orientation and business model literature. The market orientation literature comprises a set of publications that puts the customer as a prime perspective (Gheysari et al., 2012). Market orientation refers to the phenomenon that companies that continually satisfy customer needs better than their competitors create a competitive advantage and can enjoy superior profitability (Day, 1994; Jaworski and Kohli, 1993; Kirca et al., 2005; Kohli and Jaworski, 1990). Although the concept itself had already been around since the 1950s, market orientation research took up pace in the management-oriented marketing literature in the beginning of the 1990s (e.g., Jaworski and Kohli, 1993; Kohli and Jaworski, 1990; Narver and Slater, 1990). Later, this topic also started to enter strategic management research (e.g., Connor, 2007; Dobni and Luffman, 2003; Greenley, 1995; Hult et al., 2005; Hult and Ketchen, 2001; Slater and Narver, 1999).

Given the customer-driven business model development perspective of the study, we thus investigate the related phenomena from a market orientation context, focusing on business model activities that occur in response to obtained customer intelligence (cf. Kirca et al., 2005; Kohli and Jaworski, 1990). Concerning the business model concept, this study looks at it from an activity system view that offers a systemic perspective (cf. Zott et al., 2011). Therefore, we apply a recent definition of Wirtz (2011, p. 65) who specifies a business model as "a simplified and aggregated representation of the relevant activities of a company that describes how marketable information, products and/or services are generated by means of a company's value-added component".

To characterize the term BMD, we follow the approach of Casadesus-Masanell and Zhu (2013) who thematically demark their topic by referring to Schumpeter's (1934) five types of business alterations: new products, new methods, new sources, new markets, and new ways to organize business. Since each of these five types normally affects a company's activities, they demand modifying the existing or creating a new business model—be it a slight evolutionary change or a game-changing innovation. Therefore, Schumpeter's business alterations in return represent the range of practical outcomes of BMDs. Against this background, BMD summarizes a set of existing research fields that deal with business model dynamics. Following this approach, this study applies the term BMD to any evolution and innovation changes that occur within an existing or emerging business model (cf. Jensen, 2014; Wirtz et al., 2016b).

Literature Review

Since customer-driven business model frameworks have so far not been the topic of particularly intense discussions, this investigation follows the implicit suggestion of Rhoads (2015) to expand the literature review to customer-focused research. Considering the extensity and heterogeneity of the associated literature, we conducted a query of four academic databases (Academic Search Complete, Business Source Complete, and EconLit via EBSCOhost as well as Web of Science) to identify relevant business model frameworks. We searched the databases for peer-reviewed academic publications, which are expected to be high-quality, up-to-date scientific research (cf. Certo et al., 2009; Webster and Watson, 2002), that showed search term combinations of framework or business model and user, customer, client, market, centric, oriented, driven, or customer relationship management in the title or abstract. Given the broad set of search terms and the broad spectrum of academic journals, which are included in the four databases used, we are confident that this approach captures a meaningful census as recommended by methodical literature (cf. Webster and Watson, 2002).

Finally, we could identify seven studies that investigate customer-driven or market-driven BMD and provide a tangible framework or strategic concept to the reader. Yelmo et al. (2008) propose a business model for telecommunications services, in which customers become the collaborating third parties. Thus, the operator provides a platform, on which customers can create and execute content or services, creating a network of customer-generated services. Due to the practical orientation of their business model and the industry-specific service platform, the proposed model is not suitable to serve as a conceptual COBMD framework.

Hienerth et al. (2011) applied a multiple case study design to explore the implementation of user-centric business models as a complement of traditional, established business models. Here, user-centric refers to all external stakeholders. Since external stakeholders also include customers, their study appears as relevant. They identified six success factors for engaging users in business processes (real-time user-to-user interaction, transparent intellectual property policy, non-monetary incentive system, user entrepreneurship program, corporate strategy alignment, continuous communication and feedback loops). Although they provide straightforward implementation and management-oriented insights concerning success factors and strategy recommendations, the study does not provide a COBMD framework.

Pynnönen et al. (2012) present a case study-based research on customer-driven business model innovation. They conclude that a customer perspective on business models helps companies to align business with the current and emerging customer needs and that BMD is an iterative process that is mandated by external changes. Thus, their study recommends an iterative approach that is divided into four recurring phases: analyze the customer value preferences, innovate the business model, implement a customer survey to test the new model, and adjust the model. With this four-phase framework, Pynnönen et al. (2012) present a four-step activity procedure of handling BMD. However, due to the framework's process focus, it cannot provide the reader with the relevant managerial, organizational, and strategic factors that need to be considered for effective COBMD.

In their longitudinal case study, Wu et al. (2013) investigate the influence of customer knowledge on value creation and the role of IT in value delivery and value capture. Their conceptual model illustrates the links between customer knowledge management and IT-based business model innovation. In sum, effective customer knowledge management creates customer value through enhanced customization, better purchase decision-making, and improved customer experience, fostering the customers' overall consumption experience. While the model of Wu et al. (2013) is not intended to serve as a conceptual framework for BMD, they nevertheless show that it is important to integrate customer knowledge into BMD.

According to Frankenberger et al. (2013) the business model research field lacks a comprehensive framework that supports companies in BMD. For this reason, they elaborated the 4I-framework, which structures BMD along four generic phases: initiation, ideation, integration, and implementation. Their framework presents an iterative process that provides a clear implementation roadmap for companies. Since they focus on a process-based concept for practical business model innovation, the study scope does not cover the aspects of different customer groups or customer-specific knowledge integration.

Dalby et al. (2014) propose a conceptual framework that helps managers to develop business models if these are expanded into another cultural context. For this reason, they combined business model theory (Osterwalder et al., 2010) with national culture (Hofstede, 2001). Although Dalby et al. (2014) present a clear-cut framework to prepare a business model transfer to a new cultural environment, this approach is highly specific.

Kohler (2015) investigated several crowdsourcing platforms and conducted a series of management interviews to identify success factors and successful patterns of crowdsourcing-based business models. Since he found out that these companies could not only benefit from the creativity and knowledge of many contributors—including their customers—but build a crowd-driven business model that is different from traditional producer-consumer transactions, this article also contains

helpful information for BMD initiatives. However, the study does not provide a COBMD framework.

Based on the results of the literature review, we conclude that scientific literature on BMD research has so far not intensively investigated customer-oriented frameworks and has only paid little attention to the customer's crucial role in this endeavor, which is in line with the findings of Pynnönen et al. (2012), Frankenberger et al. (2013), Rhoads (2015) and Wirtz et al. (2016a). The few existing approaches that in some way address this topic rather show processual concepts that focus on procedures and workflows for customer-oriented business model implementation or define customer-oriented business models instead of reflecting customer-driven change. Apart from that, they follow a one-size-fits-all principle that does not take into account a segment-specific BMD, which considers distinct customer and development types. Considering the importance of the customer and the constant requirement for BMD, the results of the literature analysis underline the previously mentioned need for research. Therefore, this study elaborates a framework that explicitly puts the focus on the customer showing elements that are of particular relevance for successful COBMD.

Conceptual Framework for COBMD

Market orientation is about putting the customer first (Deshpande et al., 1993; Houston, 1986; Jaworski and Kohli, 1993). Following this principle in business model management means to integrate the customers' needs and preferences into the BMD activities (Osterwalder et al., 2010; Pynnönen et al., 2012) or in other words, move from innovating for customers to innovating with customers (Desouza et al., 2008; Nambisan, 2002). Thus, the customer is the starting point for COBMD.

Starting with the customer

The identified customer-oriented business model approaches do not differentiate between different customer groups and their requirements. We believe that a BMD specifically needs to take into account the particular customer preferences of the customer groups that are affected or to be addressed by the change. Because irrespective of the type of change applied, creating value for the customers remains the core principle of business models (Amit and Zott, 2001; Rhoads, 2015; Teece, 2010) and "not all customers are alike" (Ganesh et al., 2000, p. 65). Therefore, a COBMD framework requires a conceptual segmentation of a company's actual and potential customer base.

Since we could not identify an adequate conceptual segmentation in the extant scientific literature, we have elaborated the customer groups based on different concepts. Given that the COBMD framework is based on a business model developing organization mindset, we chose a demand-side perspective on the primary level (customer groups) to arrange the underlying customer needs and preferences in a transparent and applicable manner. Thus, the customer groups that are introduced in the following represent clusters that contain distinctive sets of customer needs and preferences. A further benefit of using a customer group clustering is the easy transferability into the management practice since managers are used to apply comparable clusters or dimensions when generating and using customer intelligence.

The life cycle classification of customer relationships of Campbell and Cunningham (1983) forms the basis of the conceptual customer group segmentation. They applied the life cycle concept to customers, dividing them into three groups: tomorrow's, today's, and yesterday's customers. Tomorrow's customers are those customers that the company tries to gain or regain. Today's customers are old-established customers with continually engaged relationships. Yesterday's customers buy small volume or see the products or services as pure commodities. We combine today's and yesterday's customers into one group (steady customers) since both show a long established customer relationship and a high service offer experience. Therefore, these two groups are expected to show similar customer needs and preferences.

Tomorrow's customers are denominated potential customers, which also include new customers. This group looks back at a short customer relationship and is different to steady customers since they do not show the same level of satisfaction, involvement, and loyalty like steady customers (Ganesh et al., 2000), have less customer experience, and require more development activities. However, they also show ample development potential and can have a considerable impact on new

ventures and positively affect firm performance (Kirmani and Rao, 2000; Wang et al., 2014). Summing up, we derived three general conceptual customer groups: steady, new, and potential customers.

Ganesh et al. (2000) divide the customer base into switchers and stayers on the first level. Switchers come from competitors and stayers are first-time customers that do not come from any competitor. Since these two groups differ significantly and show a distinct service offer experience level, we further divide the new and potential customer segments according to the relevant service offer experience background. The idea behind this classification is that new or potential customers that are service offer experienced have different information requirements and preferences than those that have no or only very little service offer experience. This deduction is based on the marketing classification of current and potential demanders, in which, for example, distinct information and experience backgrounds are seen as key differences (Meffert et al., 2012). Figure 1 summarizes the segmentation of the conceptual customer groups. This is the first part of the framework, which is developed further in Figure 2 and Figure 3.

Having determined the different customer groups, the next step that we expect is the identification of the respective customer preferences and the collection of relevant customer knowledge since this particular customer intelligence needs to be generated to coordinate the consequential business model development

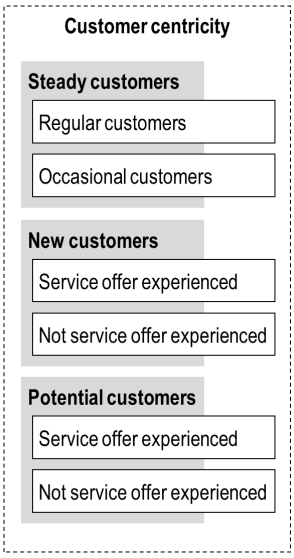

Figure 1: Conceptual Customer Group Segmentation

activities. In this context, we follow the understanding of Shapiro (1988), Day (1990), Kohli and Jaworski (1990), or Prahalad and Ramaswamy (2004), who expressed the importance of acquiring customer information and knowledge, use it to develop and implement new strategies, and integrate it into all important corporate activities. From a BMD perspective, this means to incorporate customer input into BMD, to integrate customer intelligence into the BMD process, and thus, to create value by using customer knowledge (Hienerth et al., 2011). For this purpose, companies should make systematic use of all available customer interfaces to connect with the customer.

Connecting with the customer

The customer interfaces are the actual connection between the company and the customer (Rayport and Jaworski, 2004). Here, recommendations, statements, questions, and complaints of customers can be accumulated and transferred into knowledge (Nambisan, 2002), which can be used for deriving new value-adding products, services, and activities, based on customers' expressed demands. This usually happens via a broad collection of customer interfaces, which can be of human (e.g., clerks) and automated (e.g., voice response units) nature. The managerial challenge as well as the key to success is to combine them into one coordinated system (Rayport and Jaworski, 2004) since not all customer interfaces are equally suitable to interact with the distinct customer groups.

Following Rayport and Jaworski (2004) there are different types of customer interfaces, which can be classified according to their specific interaction character. At this differentiated level, one speaks of customer touch points. These can be divided into three types (information points, service points, and transactions points), according to their primary function. Information points provide information to customers (e.g., company, product, or service information on a website). Transaction points deal with the conduct and completion of the product or service transaction (i.e., service-offer transaction at the cash desk, in the sales room). Service points handle customer service activities that are provided before (i.e., pre-services such as appointment and delivery) and after (i.e., after-service such as complaint management, satisfaction calls) the transaction.

By covering pre-service, service offer, and after-service, the three customer touchpoints can be used to gather customer knowledge throughout the entire interaction phase. From this perspective, they are a valuable tool to effectively manage the customer dialogue, and thus are the company's interface for customer knowledge management, supporting value creation for the customer and increasing the company's competitive advantage (Campbell, 2003; Garcia-Murillo and Annabi, 2002; Smith and McKeen, 2005). This way, customer knowledge management moves customers from being a passive information source to empowered knowledge partners (cf. Gibbert et al., 2002).

Customer knowledge can be gathered through typical market research and open innovation tools (for further details compare, for example, Gebert et al., 2003, Burns et al., 2014, and Guertler et al., 2015). Analyzing customer transaction and service data, customer complaint management data, customer interviews and surveys as well as market investigations are common methods to collect customer and market data (Burns et al., 2014; Gebert et al., 2003). Ideation platform allow customers to submit, comment, and rate ideas and concepts (Kaplan and Haenlein, 2010). Immersive product improvement is done through a systematic feedback channel, which is provided to the customers. This way, they can bring in their ideas and give feedback to positive and negative product or service aspects (Kirschner et al., 2011). Toolkits allow customers or partners to create or customize own designs (Piller et al., 2004). Netnography is a systematic approach to analyze current opinions of an existing community that is regarded as a helpful source of information (Belz and Baumbach, 2010). Ideally, these communities contain lead users—customers that have profound product or service experience and show particular needs earlier than the majority of the customer base (Hippel, 2005).

Malhotra (2000) proclaims that companies have to continuously interpret the signals of the market, process the collected information, and make sense of the customer information to generate applicable intelligence since there is a constant organizational need for knowledge creation and renewal if they want to remain in the market. In a similar fashion, Kastalli et al. (2013) and Denicolai et al. (2014) recommend to exploit external knowledge for lasting value creation. Figure 2 summarizes the conceptual interfaces and processes for acquiring customer intelligence and expands the conceptual customer group segmentation, which is depicted in the previous figure.

Turning customer knowledge into intelligence

The gathered customer information bits and pieces, which reflect specific customer needs and demands, have to be arranged and combined into potential future business model scenarios that allow to identify the gap between them and the current business model(s). Thereby, relevant customer knowledge turns into intelligence since it becomes "an innate capacity to use information in order to respond to ever-changing

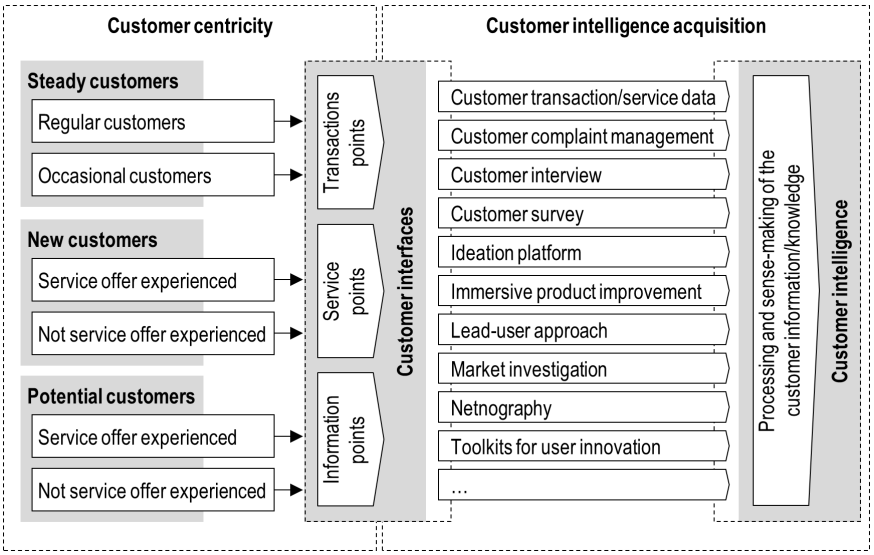

Figure 2: Customer Intelligence Acquisition

requirements" (MacFarlane, 2013, p. 19). Using this intelligence allows the company to determine the required intensity of business model change, which can be divided into four change intensity levels (cf. Wirtz, 2011): stabilization, moderate change, strong change, and radical shift. Although the terms cannot be distinguished incisively due to their floating transition, the awareness concerning the four distinctive business model change intensities is an important takeaway since differing implications are connected with the particular levels of change.

Stabilizing an existing business model, for example, is expected to place different BMD demands on a company than a radical shift. Furthermore, the customer preferences and knowledge of the associated customer groups need to be balanced according to the desired BMD target. In addition, the company should distinguish between the customer groups' information and interaction requirements that result from the BMD. Therefore, each level of change intensity is expected to require an individual customer-oriented development set. In the next step, the determined intensity of business model change is transferred into the respective BMD type. These generic BMD types are important to both academics and practitioners since this approach provides a structural context for articulating a BMD. Moreover, companies using clear BMD descriptions built up a competence for introducing anticipated change through BMD execution (Linder and Cantrell, 2000).

This study uses five distinctive BMD types (cf. Linder and Cantrell, 2000; Wirtz, 2011): The stabilization model uses only little business model modifications to make the existing business model resistant to current change. The evolution adaption model continually adapts to environmental changes with detailed modifications, while its basic structure and components rather remain constant. If the basic structure of the business model is maintained and one or more of its components are subject to significant change because new activities or functionalities are added, this refers to an extension model. In contrast, a migration model changes the basic structure due to a redesign of the business model component interactions, but more or less keeps the components untouched. In the case of the radical innovation model, both the structure and its components are transformed or newly created.

Applying customer intelligence

The applied BMD type may relate to a business model evolution (BME) or innovation (BMI). While the stabilization and evolution adaption are expected to refer to a BME and the migration and radical innovation model to a BMI, an extension model—depending on the intensity of development—may refer to either of them. Although a strict separation can be difficult in particular cases, it is important to consider both alternatives. As a rule of thumb, BME requires an existing business model that is gradually being modified. BMI calls for a change of the value proposition, modifying the value creation for the customer, or a value constellation, modifying the value chain (cf. Chesbrough, 2013; Magretta, 2002; Teece, 2010). Moreover, BMI usually demands a business model prototyping that entails more than just a mock-up of the product or service. This refers to a prototype of the entire business model, meaning to set up and configure the associated strategy, resources, competencies, financing, and so on.

Based on the combination of the relevant customer groups, the underlying customer intelligence, the predetermined intensity of the business model change, and the BMD type, the business model manager can prepare a customer-oriented business model development set, which uses segment-specific customer-oriented knowledge and provides an integrated approach to BMD. This way, the company follows a market-oriented BMD approach and moves from a one-size-fits-all to a systematically tailored customer group-specific BMD. In contrast to this combinatory, strategic character of creating customer-oriented development sets, the BMD process itself follows a linear processual realization structure (for the following cf. Wirtz, 2011). In both forms, the process starts with a feasibility study that takes a detailed look at the customer-related demand impact of the planned COBMD, taking into account the distinctive customer groups of the company. In the case of a BMI, the next step is the prototyping phase during which the business model is put into practice for the first time and fine-tuned until one final version or a set of final alternatives of the future business model are elaborated. After making the decision about the final BMD, the determined BMD is implemented. Implementation usually does not follow a linear process but rather requires constant revisions to adjust the status quo to possible deviations. Having

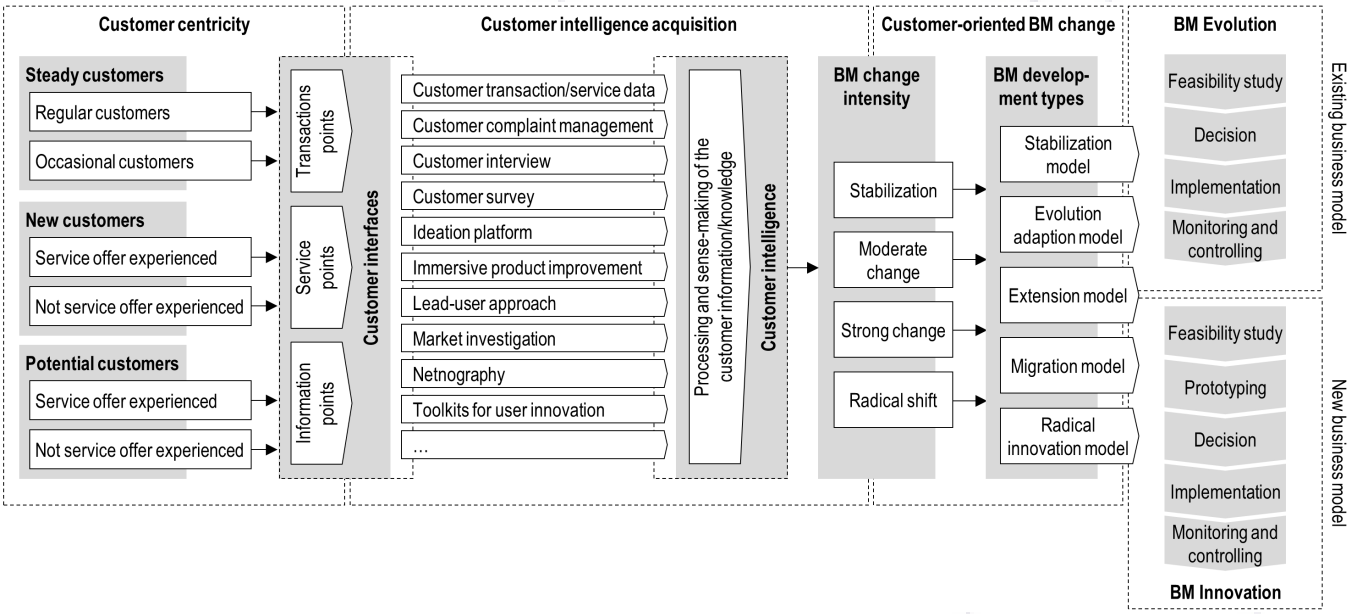

Figure 3: Integrated Framework for Customer-oriented Business Model Development

implemented the BMD, the performance of the business model needs to be steadily monitored and controlled to ensure proper operation. Figure 3 illustrates the components of the COBMD framework and their connections and complements the previous figures.

In the following, we complement the deduced conceptual findings with supplementary context from a prominent case study to highlight the elements of the COBMD framework with descriptive examples and to enrich the investigation's explanatory power (cf. Eisenhardt, 1989; Eisenhardt and Graebner, 2007).

Business Model Development Example: Google

Google Inc. is a worldwide operating technology company that specializes in Internet-related services and products, including search engines, online advertising, software, location, cloud, and email services. Google was founded in 1998 and quickly turned from an Internet start-up into one of the world's largest technology companies within a couple of years. In contrast to most other companies, Google does not rely on an established, persisting business model, but a professionally planned one that is continually extended and enhanced. The company's BME and BMI endeavors constantly develop its business-relevant activities to generate marketable information, services, and products. This makes Google a highly diversified company, creating an aligned network organization that pursues its core objectives by reasonably and strategically using each part of its network. One of Google's key success factors for this rapid progress is its excellent hybrid COBMD competency. We illustrate this by using two specific examples: (1) the continuous advancement of Google's web search and (2) Google's self-driving car.

The search engine is still the core service component, core value proposition and the main cash generator of Google's business model. Although the look and feel of the search engine website has not changed much over the years, there have been manifold BMEs to increase its efficiency and effectiveness, or in other words, adapt it to the needs and preferences of the users. Google has always been rewriting and refining the search algorithm to bring better search results quicker to the users. These service provision enhancements are made based on gathered customer knowledge from users that use the service offer—that is steady and new customers. Google can collect a large amount of customer knowledge via its transaction points, the graphical user interface of the search engine.

By applying systematic business intelligence analytics, they can derive customer-driven solutions, for example, from user search behavior and search term combinations. In addition, their service points (e.g., online forums, customer support) lead to a conglomeration

of customer knowledge, which can be transformed into products and service development intelligence. At first glance, Google uses their information mainly for one-way communication, informing customers about product and service use and developments as well as new features. However, user traffic and click statistics allow to draw conclusions on customer needs and preferences, which can be used for indirect customer knowledge creation. At this point, Google jumps from a pure product or service development to a business model development since it specifically enhances its value proposition for the customer.

In a similar fashion, the company developed Google Instant, which shows predicted search results (based on frequent search terms and topics) while you type in what you are looking for, to make the search process more efficient for the user. Moreover, the search engine nowadays combines search patterns with user preferences and online behavior to deliver personalized search results. To make search more convenient for the users, Google Voice Search was introduced. This solution allows customers to use the search engine without tiresome typing, you just speak to your online device. In 2012, the company released the online personal assistant Google Now that uses a language interface to proactively answer requests and make recommendations based on user search habits.

Other examples are Google Scholar, which is a freely accessible web search engine that indexes the metadata of academic literature, or Google Knowledge Graph, which is a database that covers the 500 million most searched terms for people, places, and things and associates them with particular meta-context to instantly provide connected add-on information to the user. With the release of the Google Toolbar—a browser integration of the search engine—and Google Mobile—an integrated online search engine in the Android operating system—the company brings the search engine to new environments. When looking at these BMEs, they can be allocated to two business model change intensities: stabilization (search algorithm refinement, Google Toolbar, Google Mobile) and moderate change (Google Scholar, Google Knowledge Graph, Google Instant, Google Voice). Apart from that, they can be assigned to three BMD types: stabilization model (search algorithm refinement, Google Toolbar), evolution adaptation model (Google Voice, Google Mobile), and extension model (Google Scholar, Google Knowledge Graph, Google Instant). Each of these developments to a large extent used knowledge gained from steady and new customers, trying to improve the service offer to them as well as to potential customers.

When looking at Google's Self-driving Car Project, this radical shift is a textbook example of a BMI. Here, Google entered uncharted territory, requiring the creation of an entirely new business model. This radical innovation model is executed separately from Google's traditional economic activities, has unlimited top management attention, and can make use of all the resources of Google's organization. This way, the Self-driving Car Project can combine the benefits of a multinational corporation with the agility of a startup. Promoted targets of the Self-driving Car Project include to cut down emissions, make driving safer, and allow more people to get around (e.g., disabled persons unable to drive). Despite these altruistic goals, Google still is a business that makes money. Therefore, the new business model will also lead to new revenue streams. Apart from that, its successful development will also support Google's current business model—the search engine—since autonomous driving allows people additional mobile Internet use. Given that Americans, for instance, spend 46 minutes per day driving in the car (NewsRoom, 2015), this is a substantial factor for increasing online traffic, and thus reflects a strategic lever for Google's future revenues.

The underlying radical innovation model permits Google to approach potential customers by entailing new products, new methods, new sources, new markets, and new ways to organize business. While Google so far is rather a pure service company, the emerging self-driving car business unit moves the company also into an automotive manufacturing setting, including typical automotive market revenue streams (e.g., car sales, service fees from after-sales and emobility concepts, royalties from product patents) and working with new business partners (e.g., automotive suppliers and car manufacturers such as Bosch, Continental, General Motors, Toyota, Daimler). This requires to build up fresh competencies and customer interfaces. By handling a complex physical product, Google has to establish—either by doing it themselves or

outsourcing—additional offline customer touch points: Service points (e.g., technical test center, repair shop) will have to be provided in a new manner since these require physical service activities at the product. Similarly, transaction points (e.g., show room) will change to a large extent as customers will expect to see, touch, and test-drive the vehicle before placing an order.

Given all these substantial changes as well as the company's strict customer focus, Google started right from scratch to include customers' needs and preferences in the development of the self-driving car. Since the project aims at potential customers that require different customer interfaces, they also had to specifically expand their customer knowledge and feedback activities. For this reason, Google conducts extensive customer tests and panels as well as market research, netnography, and immersive product improvement activities that help the company to elaborate what customers want and transfer this knowledge into their COBMD process.

Summarizing, Google's high competency of managing BMD allowed the company to quickly become a highly diversified, successful multinational organization. From this point of view, Google successfully manages the entire range of BMD activities—from stabilization to radical shift. We believe that the key to Google's success in constantly developing its business model lies in the company's philosophy, which they outline in the ten things they know to be true. The first rule "#1: Focus on the user and all else will follow" (Google, 2018) determines what should be done, while the other nine basically explain how this should be done—in summary, as effective, efficient, serious, righteous, professional, and innovative as possible. These corporate dogmas make Google focus on providing outstanding user experience and ensuring that all activities are done to ultimately serve the customer, who again constitutes the principal ground of all BMD actions. Based on this customer-centric business conception, Google successfully transforms the knowledge about, from, and for the customer into applicable customer knowledge intelligence, which forms the groundwork for their business model evolution and innovation activities. Equipped with this capacity, Google can determine the necessary business model change intensity and deduce the respective BMD type. This way, they can ensure consistent and continuous COBMD.

Discussion of Findings, Implications, and Limitations

The starting point of this exploratory study was the limited scientific knowledge about COBMD. Considering the necessity of companies to constantly renew their business models and the crucial role the customers play for any business, the lack of relevant BMD frameworks was surprising. Therefore, this study explores important elements of customer-oriented BMD and how to strategically integrate the customer perspective into this concept, aiming to derive a conceptual COBMD framework. For this reason, our article is intended to contribute to BMD research in four ways: (1) enhance our understanding of the role of the customer in BMD, (2) present additional insights into the BMD phenomenon in a general sense, (3) supply important findings and implications for academics and practitioners, and (4) provide a basis for systematic future COBMD research.

Summarizing, the study indicates that customer orientation is a vital aspect. This is in accordance with the findings of other researchers (e.g., Johnsen et al., 2006; Öberg, 2010; Selden and MacMillan, 2006; Thomke and Hippel, 2002) as well as top tier consulting firms (cf. Lamberti, 2013). Furthermore, the foregoing demonstrates a high degree of transferability and applicability of the market orientation principle to a COBMD concept. While the market orientation principle shows assorted characteristics for this phenomenon that range from understanding the customers to adjust the marketing mix (e.g., Houston, 1986) to an organization-wide market orientation to achieve long-term success (e.g., Shapiro, 1988), the COBMD concept highlights the necessity to align the strategic, the market, and the value creation components of a firm, and thus, the entire business with the needs and preferences of the customer (for business model components see Wirtz, 2016). Consequently, the COBMD can be regarded an extension of the market orientation perspective by moving from a marketing leading view to an abstract and holistic business model mindset.

The framework's underlying procedure concerning a COBMD is also in line with the processes that are recommended in the market orientation literature. From a big picture point of view, the COBMD framework starts

by generating and obtaining information concerning the customers' needs and preferences. By transforming this information into applicable intelligence, which is constantly incorporated throughout the BMD activity, the company should apply this intelligence to derive a new or adjust its business model in order to comply with the current and upcoming customer needs and requirements. Through a clear and continuous focus on sustainable and comprehensive customer orientation, companies can thus create and capture value (for similar procedures in the market orientation literature see for example Kohli and Jaworski, 1990 and Martin and Grbac, 2003).

For this reason, the acquisition of customer information is a top priority. However, not all customers are the same. While current service offer experienced customers are expected to be more relevant to BME approaches, potential customers or customers without service offer experience can be more relevant to BMI. This seems reasonable since BME principally deals with the modification of an existing business model and BMI with its renewal or the creation of a new business model. The occasional customers are a further important customer group since they may become regular customers if their preferences are well-understood and effectively integrated into the business model. They are usually a great potential for business expansion since the company already has a business relationship with them, meaning that they do not need to make cold calls to get in touch with this customer group.

Key criteria in the next step are systematic information gathering and knowledge conversion to customer intelligence. From a conceptual perspective, there are three important customer interfaces: Information points are of great relevance to acquire information from future customers as these are the key interface to new and potential customers. Since service points usually require an existing customer relationship, these are valuable interfaces to regular and occasional customers. Transaction points are crucial interfaces in all circumstances since these deal with the actual transaction. Although there are differences concerning the respective customer interfaces, maintaining a high customer group focus without neglecting a general customer orientation across all touch points is essential for effective customer knowledge management (Rayport and Jaworski, 2004).

For collecting customer information, the company can use a variety of tools, which are commonly applied in market research and open innovation (e.g., analyzing customer complaint management data, using customer surveys, netnography). By combining the relevant customer knowledge with the particular customer groups and by deriving the underlying intensity of business model change, the company turns the customer knowledge into intelligence since it becomes an "ability to cope with unpredictable circumstances" (MacFarlane, 2013, p. 19). Hereby, the company should match this information with the current business model to evaluate potential change impacts and the required business model change intensity to finally determine the respective BMD type. This allows the company to actively and systematically include their customers' needs and preferences in their BMD activities, which reduces the risk of losing out on securing promising strategic benefits and value creation potentials.

In light of the obtained findings, we can also derive a variety of recommendations for practitioners: Similarly to the insights from the market orientation research stream, the customer should be the center of attention when dealing with BMD. Thus, the development of the business model must be built upon and made in accordance with the needs and preferences of the respective customer groups. For this reason, there is no one-size-fits-all principle. This approach demands a differentiated customer group specific course of action that is based on a sound fund of relevant customer knowledge and takes into account the predetermined business model change intensity.

The collection of the demand, preferences, and knowledge of the particular customer groups requires the use of distinctive customer interfaces. Here, practitioners should aim at achieving an outstanding customer experience in the channels used in order to avoid annoying or disappointing their customers and create an appropriate mix that suits the respective requirements. Similarly, managers should select an adequate mix of market research and open innovation tools to gather customer knowledge from the particular customer groups. Management has to keep in mind that they need an adequate level of customer knowledge intelligence to establish a customized customer-oriented development set that determines a specific BMD

type and clarifies the final BMD step: BME or BMI. This way, managers provide a structural context for BMD articulation and build up a competence for introducing anticipated change through BMD execution in the long-run.

Despite its contributions to academia and management, this study has several limitations that need to be considered. However, these limitations—regarding the exploratory research approach—provide a sound basis for future research endeavors that would enhance scientific COBMD knowledge. This exploratory study focuses on the positive side of BMD. However, in other cases there may be negative mechanisms or results through which a COBMD may hinder firm performance. According to Veryzer (1998), for instance, an exclusive focus on customer knowledge may lead to an immoderate dependence on customers. Thus, identifying and investigating less successful COBMD situations seems to be an interesting research endeavor.

Against this background, case studies will help to broaden researchers' and practitioners' understanding of COBMD. Here, comprehensive in-depth qualitative interviews focusing on COBMD barriers and success factors are needed to better understand its intricacy. Apart from qualitative studies, future research should also challenge the COBMD framework with quantitative empirical evidence on several levels. We see, for instance, a need for causal-analytical investigations that further clarify which elements of the COBMD framework are important for the respective stage and which factors are the main drivers of overall BMD success. In a similar fashion, future research should conduct quantitative studies that investigate the contextual and environmental success factors of BMD and provide solid empirical evidence for BMD scholars and managers.

Given the study's target of providing a generic framework, it does not take into account that there may be additional variations on a deeper level within the customer groups or the customer intelligence part. For this reason, further studies are needed that provide additional insights into the differentiation of steady, new, and potential customers and if these groups show distinctions concerning the different BMD types. In this context, future research should also clarify if the five conceptual BMD types are suitable or if there are further BMD types that have not been addressed in the business model literature yet. Concerning the need for further insights on the customer intelligence part in BMD, additional field studies and explorative interviews with BMD experts seem of high value to generate further knowledge on this issue.

Moreover, the theoretically underlying rather direct connection of distinct business model change intensities and specific BMD types should be further investigated. In this context, additional insights regarding COBMD are important, as scholars and managers grapple with the growing demand of ever-changing environmental conditions and continuously altering customer preferences that require constant BMD. In addition, further studies that provide insights on the internal and external conditions that lead companies to a BMI or a BME seem helpful. Here, research should further elaborate the differentiation between BMI and BME and clearly define the transition between the two forms of BMD (e.g., is the transition between those two rather fluent, progressive, or clearly separated?).

The illustration of the market research and open innovation tools is not exhaustive and only reflects their conceptual integration into the framework since such an analysis is out of scope of this article. Here, review studies in the fashion of Guertler et al. (2015) that summarize the status quo are helpful to science and management. Building upon existing knowledge, new studies should also present future concepts and analyze the particular benefits and range of application of the respective tools for customer knowledge generation. Since COBMD often demands to build up fresh competencies for customer knowledge generation and transformation into new business models, examining antecedents and success factors of COBMD appears as a promising direction for future research. In this context, dynamic capability view approaches that deal with the development and renewal of internal competencies (cf. Augier and Teece, 2007) appear expedient. Furthermore, future research should empirically investigate which customer information tools and instruments are of particular importance for deriving customer intelligence in BMD settings. Apart

from that, researchers should challenge the proposed COBMD framework with regards to industry-specific modifications that may be necessary to adapt the framework to particular industry settings since there may be differences among organizations with distinctive structures and processes or among organizations that offer services and organizations that offer products. Concluding, the findings of this study provide various insights into COBMD. Since there also remain open issues further qualitative and quantitative research is necessary to conceptually expand and empirically validate the study's findings.

Conclusion

The customer decides what a business is and how much the products and services of a business are worth (Drucker, 1954). But customers' needs and preferences change—and due to massive external disruptions the speed of chance increases. Thus, managers are increasingly confronted with strategic, operational, and systemic shifts that require continuous and effective BMD to adjust the business model to the requirements of the customers. Putting the customers' needs and preferences at the center of any BMD initiative is therefore essential. Furthermore, BMD has to be conducted fast and repeatable since companies today continuously have to act—as reacting can already be too late. Against the still limited understanding of business model development that particularly takes into account the customers' needs and preferences, this is a challenging issue for academics and practitioners. The proposed COBMD framework, which is derived from the business model and market orientation literature, and thus, systematically combines a holistic business model mindset with a thorough customer focus, serves as helpful guidance to research and management in this matter.

Throughout the entire research endeavor for this study, we learned that BMD literature can greatly benefit from the insights of the market orientation literature. Therefore, we hope to see more research that connects these two fields in the near future. The core issues for successful COBMD are a clear and useful customer group specification, the acquisition of customer information, the transformation of the customer information into applicable customer intelligence, the application of the customer intelligence to derive a new or adjust the existing business model, the preparation of the customer-oriented business model development set, and the implementation of the changes that result from the business model development.

Against this background, scientific research should generate further theoretical insights on these issues and provide managers with solid concepts and process cycles that support them in their business model development endeavors. Companies should develop the necessary skills and competencies to learn about, from, and for the customer, to transfer this knowledge into applicable business model development intelligence to better satisfy their customers' needs and preferences, and to successfully implement their business model developments. This way, they can create competitive advantage and participate from the value that they generate for their customers.

Despite its contributions, this study also has several limitations, which mainly result from the exploratory research approach and the study's key goal of providing a generic framework (for details, please see the section "Discussion of findings, implications, and limitations"). Thus, further studies are needed that provide additional insights to enhance scientific COBMD knowledge.

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About the Authors

Professor Bernd W. Wirtz holds the Chair for Information and Communication Management at the German University of Administrative Sciences Speyer. He has published widely on issues pertaining to business models, electronic business, strategic management, media management, and marketing. Email: ls-wirtz@uni-speyer.de

Professor Peter Daiser holds the Professorship in E-Government and Digital Transformation at the Municipal University of Administration in Lower Saxony. His research focuses on business models, public corporate governance, and digitalization. Email: peter.daiser@nsi-hsvn.de

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Identifying Contexts of Business Model Innovation for Exploration and Exploitation Across Value Networks

Louise Kringelum[1] and Allan Næs Gjerding[2]

Abstract

Purpose: This exploratory study develops insights into how inter-organizational projects can be part of a process of intra-organizational business model innovation in an incumbent firm.

Design/Methodology/Approach: The present study is based on a longitudinal case study of an asset-based logistics intermediary. The case study focuses on four instances of inter-organizational projects in a port system. Following an abductive logic, the empirical findings result in a conceptualization of business model innovation that describes how to strike a balance between exploration and exploitation across intra- and inter-organizational levels.

Findings: We present a novel conceptualization of business model innovation as a process that bridges the exploration and exploitation of business opportunities by means of organizational integration within value networks.

Originality/Value: Business model innovation entails both exploration and exploitation of business opportunities. However, as stated by Levinthal and March (1993), prior experience tends to trap firms in patterns of competences that limit future balancing of exploration and exploitation. Based on the findings of a real-time case study, we suggest how firms can protect themselves against trapping by creating contexts of exploration and exploitation that span organizational boundaries. In doing so, we respond to the call put forward by Wilden *et al.* (2018) for research on how institutional context affects the exploration-exploitation balance, which represents a research gap. Addressing this research gap from a business model perspective represents a novel discourse in business model innovation.

Keywords: Business Model Innovation; Exploration; Exploitation; Value Network

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1-2 Department for Business and Management, Aalborg University, kringelum@business.aau.dk, ang@business.aau.dk

Introduction

The present paper responds to the call put forward by Wilden *et al.* (2018) for research on how institutional context affects the balance between exploration and exploitation, which represents a research gap in the surge of academic work that has followed upon the seminal contribution of the exploration-exploitation paradox by March (1991). While the paradox was originally phrased in terms of processes of organizational learning, the subsequent research has covered a broad range of additional topics, including dynamic capabilities, knowledge management, technological innovation, and the relationship between ambidexterity and organizational performance (Wilden *et al.*, 2018: 3-7). A core theme is that firms develop routines and procedures for decision-making that reflect how problems have been solved and potentials have been realized in the past, which tend to trap firms in patterns of competence that limit the ability to balance exploration and exploitation (Levinthal and March, 1993), hence the paradox. The paradox represents a challenge of business model innovation, as firms must be prepared to address environmental uncertainty as opportunities that can be either explored or exploited (Schneider and Spieth, 2013) through the existing or new business models. In the context of business model innovation within a port system lead by a dominant asset-based logistics intermediary, we offer a conceptualization of how to strike a balance between contexts of exploration and exploitation in a value network to mitigate the trapping effect of prior experience for the focal firm.

At the outset, it must be considered that the context of business model innovation is not a trivial one, since the very concept of business model is widely diffused (Ghaziani and Ventresca, 2005; Lambert, 2015) and therefore holds no unitary definition (Al-lebei and Avison, 2010; Jensen, 2013). According to Schneckenberg, Spieth and Matzler (2016), this conceptual ambivalence is caused by the fact that the gestalt of the business model as a research object has not been adequately defined. It has been argued that a business model paradox exists in the sense that the concept is widely criticized while simultaneously being highly popular, prevalent, and applied among both scholars and practitioners (Klang, Wallnöfer and Hacklin, 2014).

In consequence, there is no common understanding of business model innovation (Schneider and Spieth, 2013; Foss and Saebi, 2017). Because business model innovation has received increasing research and management attention since the turn of the century (Wirtz, Göttel and Daiser, 2016), the research community has experienced a need to unify extant research on business model innovation, which has resulted in the publication of several broad, synthesizing literature reviews on the topic see; Schneider and Spieth (2013), Schneckenberg, Spieth and Matzler (2016), Foss and Saebi (2017) and Wirtz and Daiser (2017).

The proliferation of understandings of business model innovation represents what Hirsch and Levin (1999) have described as the occurrence of umbrella constructs, i.e. constructs that try to comprehend broad phenomena in new lines of research. Umbrella constructs reflect that research is on the verge to establish patterns of mutual understandings that need to be validated within the scientific community. Hirsch and Levin (1999: 204-207) portray this process as a cycle where emerging excitement creates a validity challenge that calls for tidying up with typologies. In the following, we contribute to tidying up by identifying dominant perspectives in business model innovation and developing a conceptualization of business model innovation.

Our contribution is based on the application of abductive reasoning (Dubois and Gadde, 2002) to bridge existing theoretical explanations with a longitudinal case study in an asset-based logistics intermediary including four subcases of inter-organizational projects in a port system. Inspired by Nenonen and Storbacka (2010), who claim that business logics with focus on value chains is being replaced by business logics focusing on value networks, we argue that the case captures an evolving trend of business model innovation. In doing so, we answer the call for more research on the intra- and inter-firm challenges of business model innovation put forward by Berglund and Sandström (2013) and Foss and Saebi (2017).

The remainder of this paper is organized as follows: in Section 2, we present three existing perspectives on business model innovation and the fundamental

premises of these. We discuss the interconnections between the perspectives and the existing research gaps. Based on these insights, we then elaborate on the applied research methodology as well as the abductive process underlying the methodology. This is followed by a description of the longitudinal case study. Section 4 covers the abductive reasoning (O'Mahoney and Vincent, 2014) by which we have identified different instances of business model innovation in four embedded subcases of inter-organizational projects in the longitudinal case study. Subsequently, a conceptualization of business model innovation in value networks is compiled and related to existing theory in the field. Finally, the scientific and managerial implications, research limitations, and future avenues for research are put forward and discussed in Section 6.

Perspectives on Business Model Innovation

The approach taken to business models in the current paper is inspired by Shafer, Smith and Linder (2005: 202) who, "... define a business model as a representation of a firm's underlying core logic and strategic choices for creating and capturing value within a value network," as value creation is increasingly regarded as a phenomenon occurring in value networks (Massa and Tucci, 2013). Although often applied in research on business models, the structure of value networks is rarely defined. We adhere to the definition proposed by Allee (2000), who state that: "A value network generates economic value through complex dynamic exchanges between one or more enterprises, its customers, suppliers, strategic partners, and the community" for which reason it can be regarded from the point of view of a focal firm. While the value network can function as a source of both complementary and substitutive resources (Pynnönen, Hallikas and Ritala, 2012), this also implies that firms due to the intricate links of resources and activities across the value network cannot maintain complete control of their operations (Berglund and Sandström, 2013).

Based on the definition presented above, we regard business model innovation in incumbent firms as a process of renewal that can occur through contexts of exploitation and exploration in a value network. The research question that we address is how inter-organizational projects contribute to intra-organizational business model innovation in an incumbent firm. To answer this question, we elaborate on perspectives of business model innovation to emphasize the boundaries inherent in the existing theoretical conceptualizations, and we argue that firms can innovate their business models through contexts of exploitation and exploration across the value network. By pursuing this line of questioning, we follow the call from both Spieth, Schneckenberg and Ricart (2014) and Storbacka *et al.* (2012) to analyze the process of integrating stakeholders in business model innovation and to reconfigure existing models to enable collaboration. In doing so, we are inspired by a number of scholarly reviews of dimensionality in business model innovation research, notably Schneider and Spieth (2013) and Foss and Saebi (2017). Furthermore, we build on a variety of contemporary business model innovation classifications and typologies, including Amit and Zott (2001, 2010), Hock, Clauss and Schulz (2016), Wei *et al.* (2014), and Taran, Boer and Lindgren (2015).

Current conceptualizations of business model innovation

Multiple researchers have highlighted the need to integrate customers, external network partners, and additional stakeholders when undertaking business model innovation (Giesen *et al.*, 2010; Frankenberger, Weiblen and Gassmann, 2014; Spieth, Schneckenberg and Ricart, 2014; Laudien and Daxböck, 2015). It is generally acknowledged, that business model innovation is not confined to the spatial boundaries of the focal firm. Rather, it goes beyond the focal firm (Clauss, 2016) and its existing boundaries (Cavalcante, Kesting and Ulhøi, 2011) and is often interlinked with the value chain or network (Voelpel, Leibold and Tekie, 2004; Girotra and Netessine, 2011; Breuer and Lüdeke-Freund, 2017).

In order to identify existing conceptualizations of business model innovation that transcends firm boundaries, a theoretical review including 45 peer-reviewed papers on business model innovation was undertaken (Petticrew and Roberts, 2006). Based on this, three perspectives were identified as recurring in business model innovation: 1) change or innovation; 2) novelty and efficiency; and 3) incremental and radical. These three perspectives

represent summative conceptual dimensions of existing themes in the current literature on business model innovation and will be elaborated in the following to provide the foundation for the abductive reasoning behind the conceptualization presented in section 5.

Change or innovation

Since both the classification of innovation (Garcia and Calantone, 2002) and of business model innovation (Gassmann, Frankenberger and Sauer, 2016; Wirtz, Göttel and Daiser, 2016; Foss and Saebi, 2017) is ambiguous, a recurring question in the current literature is when to regard changes in business models as innovations (Spieth and Schneider, 2016).

As some of the first authors to discuss this subject, Linder and Cantrell (2000) highlighted the static one-dimensional perspective of business models, as it merely presents the status quo at one point in time, and thus does not take into account the continuous need for change. As a result, they introduced change models such as (p: 1): "... the core logic for how a firm will change over time in order to remain profitable in a dynamic environment". Four change models were advanced based on the degree of change in the core logic: realization models, renewal models, extension models, and journey models. Realization and renewal models cover the exploitation and exploration, respectively, of the existing business model. Therefore, they are rarely regarded as business model change according to the model presented by Linder and Cantrell (2000). A similar distinction is put forward by Cavalcante, Kesting and Ulhøi (2011), in which they distinguish between business model creation, extension, revision, or termination, depending on the degree of innovation. In doing so, Cavalcante, Kesting and Ulhøi (2011) introduced various levels of analysis regarding the innovation of processes and the change in business models as different entities as well as the role of individual agency in the process of change.

The exploration of business model innovation by Mitchell and Coles (2003) was based on a distinction between the degrees of change and innovation, which are categorized in terms of the number of changed business model elements. Based on this, they proposed four types of models: 1) business model improvement; 2) catch-up; 3) replacement; and 4) innovation.

In short, current research that conceptualizes business model innovation as either change or innovation reflects a focus on both the cognitive dimension of logic and the operational dimension of building blocks and elements. The distinction between cognitive and operational dimensions reflects that business model innovation can occur at different levels of analysis. While Mitchell and Coles (2003) argue that the change of one building block is merely a business model improvement, Linder and Cantrell (2000) claim that even marginal changes can reflect innovation to the extent that the change of one building block represents a completely new business logic. Consequently, the level of analysis as well as to whom the innovation represents something new must be considered as dimensions when conceptualizing business model innovation.

Novelty and efficiency

A recurring theme in conceptualizations of business model innovation is the organization of transaction costs. This theme has arisen from one of the early perspectives on business model innovation, which was developed by Amit and Zott (2001) in their analysis of value creation in e-business. Their model of value creation potential that can lead to new sources of innovation, i.e., business model innovation, has inspired many ensuing papers on the subject see e.g.; Wei *et al.* (2014) and Hock, Clauss and Schulz (2016), as well as the their own continuous development focusing on business model innovation, as seen in Amit and Zott (2010, 2012) and Zott and Amit (2008).

Amit and Zott (2001) included four dimensions of value creation in their model: efficiency, complementarities, lock-in, and novelty. These four value drivers, which are firmly grounded in economic theories (Gassmann, Frankenberger and Sauer, 2016), can be considered as different dimensions of change which can be deployed as means of business model innovation. Especially the dimensions of efficiency and novelty, inspired by transaction cost economics and Schumpeterian innovation (Gassmann, Frankenberger and Sauer, 2016), have been acknowledged in business model research. Wei *et al.* (2014) applied the design themes of novelty and efficiency in an analysis of the fit between technological innovation and business model design. While novelty-centered business model design covers all areas of content, structure, and governance as

a part of the innovation, efficiency-oriented business model design is limited to focusing on the organization of the boundary-spanning activity system to enable efficiency, seemingly focusing primarily on the transactions found within the structure. The business model innovation is in this context tightly linked to the reduction or new organization of transaction costs (Zott and Amit, 2007; Casadesus-Masanell and Zhu, 2013). Following the same track, Hock, Clauss and Schulz (2016) include the notions of novelty and efficiency as business model design themes in analyzing organizational value and capabilities. They employ this division in connecting business model innovation and behavioral management to show how the underlying organizational value affects the capabilities needed in the innovation process to enable new transactions or minimize existing transaction costs.

Incremental and radical innovation

The third perspective found in extant research on business model innovation focuses on value and is frequently explored along a continuum of incremental and radical innovation. The degree of change is often analyzed in terms of changes in value proposition, value creation, and value capture (Velu and Jacob, 2016).

Based on the degree and type of innovation and the change of building blocks, Witell and Löfgren (2013) identified three degrees of business model innovation that occur through transition strategies: no or minor changes, incremental innovation, or radical innovation. In business model change, no or minor changes occur in the building blocks. Incremental business model innovation is defined as changes in the content or structure of the business model, while radical business model innovation takes place when governance is affected, which is often marked by a change in business relationships (Witell and Löfgren, 2013: 528). As the distinction is essentially based on the ways in which the revenue structure of the firm changes, it is focused primarily on the demand-side of business model innovation, which is generally referred to as value creation and value capture.

Summary

The three perspectives presented above each emphasize three converging perspectives of business model innovation. The nature of business model innovation depends on how the change in question affects the cognitive dimension of the business model and the interplay between business model constituents represented by the operational building block dimension. Furthermore, the nature of business model innovations are affected by the objective of minimizing or restructuring transaction costs or increasing the value created and captured. The three perspectives presented above converge in a number of areas, and complement rather than substitute each other. Essentially, value and cost are not opposites but rather reciprocal in nature. Innovating transaction costs, i.e., managing costs most optimally, is basically a search for stability. In contrast, innovating to create or capture value requires flexibility and change. The contradictions inherent in this relationship of perspectives do not stand out in the existing literature, but instead represent a challenge inherent in most processes of business model innovation as one of balancing the tensions of exploration and exploitation (O'Reilly and Tushman, 2013).

In the following abductive case analysis, the three perspectives on business model innovation have been used to bridge the empirical observations and existing theoretical explanations. A bridging mechanism is inherent in the abductive approach, and including the three perspectives have, in the present case, enabled the identification of the foci in business model innovation, cost reconfiguration or value creation, and the means for structuring the process, e.g. whether the process unfolded as change or innovation both cognitively and operationally. We applied these distinctions to explore the mechanisms affecting a process of business model innovation that occurred at various levels of analysis.

The remainder of this paper is devoted to presenting a process of business model innovation by abductively combining the empirical data and the conceptual foundation presented previously. This is concluded by presenting a conceptualization of how to strike a balance between exploration and exploitation when business model innovation is undertaken across a value network.

Research Methodology

Since the research described in this paper is abductive in nature, the process of developing a conceptual framework of business model innovation is based upon an engagement with the actors in the case at hand, i.e., the

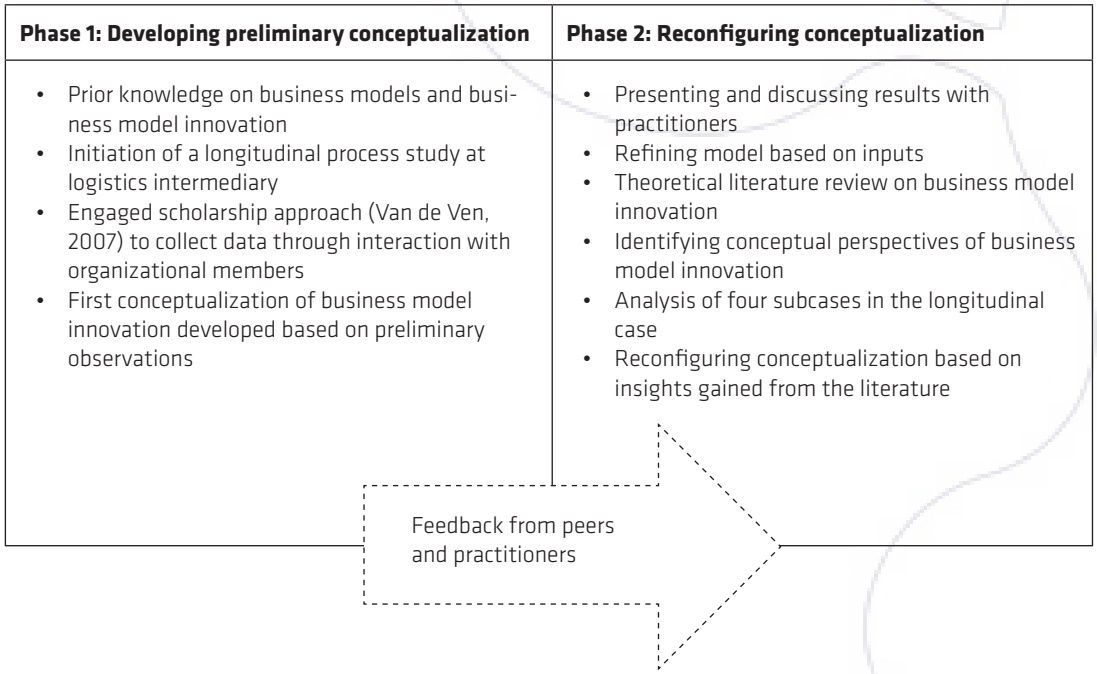

Figure 1: An abductive process of conceptualizing business model innovation

logistics intermediary. Abduction entails re-describing the empirical, observable world through abstraction in order to describe the causations creating patterns in events (O'Mahoney and Vincent, 2014). Following an abductive logic, the research process has combined empirical data, case analyses, and theoretical modeling in order to expand the knowledge on both theoretical concepts and empirical phenomena (Dubois and Gadde, 2002) and to develop probable explanations of causality in a critical realist sense (Edwards, O'Mahoney and Vincent, 2014).

The research has unfolded as a longitudinal process study spanning from 2013 to 2016 based primarily on qualitative data. Inspired by previous research on business models (Nenonen and Storbacka, 2010), the research process has progressed through two phases, which will be elaborated in the following.

Data collection and analysis

In Phase 1, data were primarily collected via engaged scholarship (Van de Ven, 2007) in the logistics intermediary and supplemented by secondary data, summaries of meetings, and email correspondences. The engaged scholarship approach (Van de Ven, 2007) enabled the inclusion of perspectives from multiple stakeholders, which has in turn ensured a focus on both the theoretical and practical dimensions of the subcases. In order to gain interactional expertise (Collins, 2004; Langley *et al.*, 2013) and in-depth knowledge on both the daily processes and top management decision making, we participated in and facilitated seminars at all levels of the logistics intermediary and with external stakeholders taking part in the process of innovation. We participated in eight strategy seminars with external participants of which seven were recorded, transcribed and thematically coded in Nvivo (Miles, Huberman and Saldãna, 2014). Summaries were written concurrently and approved by all participants. The data were included in the analysis with the aim of identifying existing mechanisms (Ackroyd and Karlsson, 2014) affecting the processes of business model innovation in the logistics intermediary.

To ensure breadth in describing and analyzing the process of business model innovation, the case study is presented through four embedded subcases (Yin, 2003), representing four inter-organizational projects in which the logistics intermediary took part. This approach is possible because we have followed multiple projects that have been conducted as a part of the overall business model innovation within the firm of the logistics intermediary between 2013 and 2016.

Based on the empirical observations and a conceptual grounding in business model research, a preliminary model conceptualizing the process was developed.

Between Phases 1 and 2, see Figure 1, the preliminary model was presented at an academic conference and to the organizational actors of the case study. The input from these events triggered the initiation of Phase 2 and the need for a more extensive literature review covering existing perspectives of business model innovation as described in Section 2. A broader conceptual insight enabled the reconfiguration of the preliminary model, supplemented by an analysis of the four sub-cases that also substantiated the conceptualization and the constructs included herein.

The Case of the Logistics Intermediary and the Value Network

The longitudinal case study followed the process of business model innovation in a logistics intermediary. The logistics intermediary is a municipality-owned private limited firm. The firm acts within a port system and is locally-embedded due to extensive asset commitments and a dual role of contributing to regional growth while maintaining a viable business. For this reason, the political pressure induced by being owned by a municipality affects the objectives of the firm and the competitive potential. The dual roles define the business logic of the logistics intermediary, which must balance an objective of profit maximization while also initiating projects for the benefit of a multitude of stakeholders in the port system. Consequently, the logistics intermediary functions as a focal firm in a value network of logistics operators, transport intermediaries and manufacturing firms, with whom the firm is experiencing complementarity and substitutability of resources and activities due to the existing transactional links established between the firms.

What initiated the case study was the baffling observation that the logistics intermediary CEO continuously stated that the existing business model was not viable. He argued that in order to ensure future survival, new approaches to manage the relations with external stakeholders had to be considered: "This is a part of our strategy now: how can we activate collaboration with companies so we can create trust, which can create intuitive exchange and openness, so we can help each other obtain lower costs and with it streamline or create new ideas" (CEO Strategy Seminar 2). This statement marked a break with the existing business logic in the port system, which was characterized by sub-optimization in the existing value chains, limited integration, low levels of trust and, as a result, no openness between firms, impairing the ability to meet emerging competitive challenges.

The emerging challenges experienced within the port system reflect a global trend where port competitiveness is no longer determined by the result of a single firm or value chain but rather by collaborative efficiencies of value networks (Meersman, Van de Voorde and Vanelslander, 2010; van der Lugt, Dooms and Parola, 2013). The development reflects that managerial focus increasingly needs to shift from value chain to value network (Malhotra, 2000; Nenonen and Storbacka, 2010). However, the majority of firms observed in the port system reported that increased competitive pressures made cost reductions on primary activities necessary. Given the nature of exploitative behavior, cost reductions obstructed the potential of exploration of new relations across the value network. This mismatch between future challenges and current solutions provided by firms motivated the logistics intermediary to initiate a process of business model innovation.

Thus, the reason for changing the existing business logic of the logistics intermediary was to pursue a managerial objective of growth by reconfiguring the relationships across the value network of the port system, thereby assuming a baffling approach to innovating the existing business model both intra- and inter-organizationally. This process is explained in the four inter-organizational projects presented in the following.

Four projects stimulating business model innovation

Throughout the research project, we observed and took part in four projects in which the logistics intermediary interacted with external stakeholders to strive towards the above-mentioned objective. We followed the four projects concurrently with the overall process of business model innovation in the logistics intermediary. The projects were initiated with stakeholders across the value network, as depicted in Figure 2, which illustrates a section of the value network of the logistics intermediary within the port system. The arrows indicate the flow of tangible and intangible goods in which

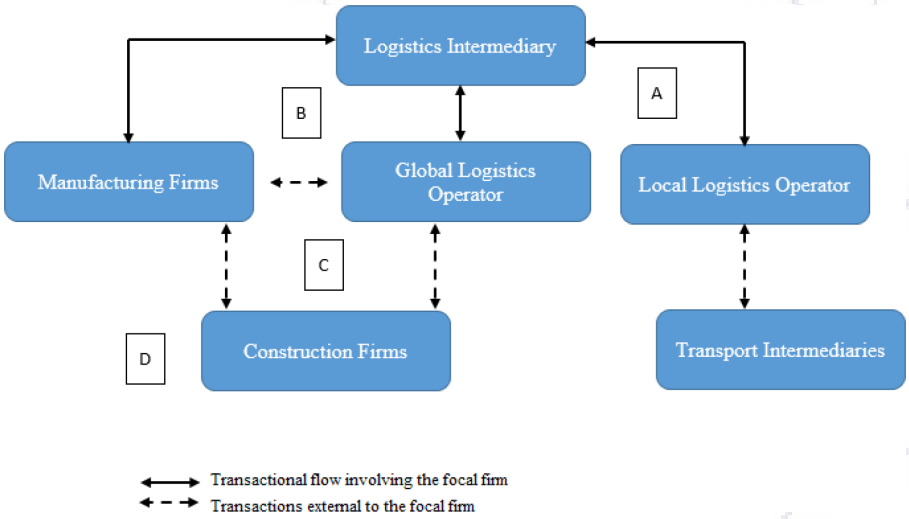

Figure 2: Inter-organizational projects across the value network

the logistics intermediary participated, while the dotted links represent transactions external to the firm and thus beyond the existing value network. The four projects are marked by letters and placed according to the existing transactional flows.

In the first project, **Project A,** the logistics intermediary collaborated with a local logistics operator with whom the logistics intermediary had existing transactional links based on ownership of a logistics hub. The aim of the project was twofold: 1) to operationally streamline the activities at the hub with the aim of reducing costs and increasing efficiency; and 2) to uncover the growth potential and eliminate obstacles in reaching out for new potential customers of transport intermediaries. The project was aimed at transport intermediaries with whom only the operator had recurring transactions, which meant that the project enabled an exploitation of existing value creating activities by connecting them to the existing transactions between the operator and transport intermediaries. For this reason, the project was highly dependent on the knowledge and legitimacy of the operator.

Project B and **Project C** were both part of a long-term collaboration between the intermediary and a globally oriented logistics operator. The first project, **Project B**, was based on asset similarity between the operator and the intermediary regarding the provision of services to manufacturing firms in the value network. By coordinating existing activities through both knowledge- and asset-sharing, the firms improved and expanded their range of services, thus increasing the scope of value creation whilst additionally obtaining intangible benefits through co-branding.

Based on the interaction and trust-building in Project B, **Project C** was initiated with the purpose of taking advantage of several expected industrial changes concerning the logistical flow across the value network. Both the logistics intermediary and the global operator were expecting and threatened by future changes, and decided to proactively develop an innovative solution to support their own future value creation. The project was aimed at the triangle-flow between the global operator, manufacturing firms, and construction firms, and thus extended the existing transactional links of the logistics intermediary. For this reason, it marked a significant shift in their business logic in order to create value for firms outside their current value network.
Extending significantly beyond the value network of the logistics intermediary, the aim of **Project D** was to innovate the construction process of goods from several manufacturing firms, thus radically changing the operational process underlying their supply chain. Several companies, including local logistics operators and education centers, were considered as partners in terms of daily activities and management, and the value created was to be captured mostly by the construction firms. However, due to lack of both operational and cognitive links between the firms the project did not progress beyond the idea phase.

Conceptualizing Business Model Innovation

The preliminary model developed in Phase 1 (see Figure 1) depicted the overall process of business model innovation for the logistics intermediary as interacting with firms in both familiar and unfamiliar contexts. The variety of perspectives reviewed in Phase 2 added to the insights of what constitutes the contexts, providing a new setting for empirically conceptualizing business model innovation as changing relationships within a value network along different dimensions. The identification of the three perspectives on business model innovation – i.e. change-innovation, novelty-efficiency, and incremental-radical provided different lenses for elaborating on the mechanisms underlying the process. These complementary perspectives were relevant as the analysis of each project demonstrated that different reasoning and objectives affected the extent to which ongoing activities and the relational links of the value network were changed. In consequence, the model was augmented by the dimensions of minor, medium and major changes in logic behind the business model of the focal firm.

In doing so, the theoretical perspectives of organizing transaction costs and managing activities for value creation either cognitively or operationally, enabled a reconfiguration of the two contexts to be defined respectively as contexts of exploitation and exploration of the existing business model with differing degrees of uncertainty, as illustrated in Figure 3. The exploitation context entails low risk changes of the business model close to existing activities of the focal firm and within the transactional boundaries of the existing value network. The exploration context is more uncertain, extending beyond the existing value network with a potential to increase the radicality of innovations through new value creation.

Furthermore, the case study showed that competitive pressures increasingly challenged the business logic of cost reduction, that permeated the value network, stimulating collaboration instead of sub-optimization across firm boundaries. As a result, processes of exploring value co-creation were evolving across the value network. These insights led us to conceptualize business model innovation as a process by which firms balance exploration and exploitation through the context of the value network. The final elaboration of the conceptualization is presented in Figure 3. In the following, the conceptualization will be described and discussed based on the empirical insights from the four subcases.

The subcases show three important insights. First, business model innovation is driven by a change of logic in the focal firm that can be operationalized within and across the contexts of exploration and exploitation. Second, exploration and exploitation does not necessarily represent opposite logics, but may be part of a continuum of logics where the distinction between

Change in logic / Change in value network	*Context of exploitation*	*Context of exploration*
Minor	1. Fine-tuning existing activities (A)	2. Exploiting opportunities, i.e., preparing them for being moved into the exploitation context
Medium	3. Changing activities inspired by the advent or creation of new opportunities (B)	4. Exploring how to exploit opportunities which are discovered or co-created (C)
Major	5. Exploiting opportunities moving in from the exploration context	6. Exploring opportunities which are discovered or co-created (D)

Figure 3: Business model innovation logics within two contexts

innovation and change becomes less important. Third, business model innovation can be based on explorative or exploitative search, depending on the context in which it takes place, but it can also be based on a process by which explorative search in one context leads to exploitative search in another context.

In the following, the conceptualization is substantiated by exploring the four inter-organizational projects of the case study. We will denote the logistics intermediary as the focal firm undertaking business model innovation by engaging in inter-organizational projects. The purpose is to distinguish between business model innovation of the focal firm and the change or reconfiguration of relationships across the value network. This distinction of micro- and meso-level business model innovation will be further discussed in Section 6.

Inter-organizational projects for business model innovation

A within-case analysis of the subcases revealed that the previous degree of interaction between the focal firm and the external stakeholders, and the scope in regards to affecting third parties, varied considerably. The scope ranged from seeking operationalization efficiency in activities to improved communication in order to enable value co-creation by altering the relations of the existing value network and inherent supply chains.

Projects A and B took place within the existing value network based on the current logic of value creation of the focal firm. The overriding aim was to exploit existing activities and appertaining relations. In Project A, activities were adjusted and relations strengthened based on existing transactions, while Project B provided medium changes in the value network by mitigating transaction costs through novel asset sharing. Project C involved transcending the existing value network by exploring the scope of value creation in order to transcend the value network relations of the focal firm. This was enabled through value co-creation with a partner from the existing value network. As a result, the addition to the value network represented a medium change, as existing relations mediated the exploration. Project D was planned as exploring completely beyond the existing value network, based on collaboration with multiple participants outside the existing value network. The value capture of Projects C and D were not explicated, but were expected to ripple through the value network rather than be centered at the focal firm, based on a major reconfiguration of the value network.

As mentioned previously, Figure 3 embodies the modes of innovation that we have identified from our review of research on business model innovation. The conceptualization can be interpreted as instances of business model innovation, as in the case of projects A and D, but also as a cyclical process starting with general exploration beyond the existing value network (6), exploring how to exploit the identified value (co)-creation potential (5), exploiting the opportunities by establishing relations, thus extending the value network of the focal firm, followed by preparing (4) and moving (3) the project into the context of exploitation. This process can require reconfiguration and thus major changes to the value network of the focal firm. Moreover, exploiting opportunities will often necessitate changing activities (2), which directly influences the micro-level business model of the focal firm. The activities must continually be fine-tuned according to developments in the value network (1).

In sum, the conceptualization represents a process of business model innovation for a focal firm that is based on balancing the exploration and exploitation of business opportunities. In addition, it indicates how these opportunities can drive organizational integration as the focal firm manages the relational links of the value network in order to achieve exploration and exploitation. It emphasizes the prerequisite of moving between contexts of exploitation and exploration as one of value exchange configuration, drawing on the relational dimension of business model innovation (Dyer and Singh, 1998; Gassmann, Frankenberger and Sauer, 2016). The stability-seeking approach of activity-system reconfiguration can thus inform the innovation of business models within the context of exploitation, while the context of exploration provides an arena for establishing new approaches to value creation or potential value co-creation.

Discussion and Concluding Remarks

The paper has presented a novel conceptualization of business model innovation as a process that bridges the exploration and exploitation of business opportunities

by means of organizational integration across value networks. Based on a longitudinal case study involving four sub-cases, the conceptualization suggest how firms can protect themselves against being trapped by prior experience that prevent the firm from striking a new balance between exploration and exploitation. The paper contributes to the validity challenge (Hirsch and Levin, 1999) of current research in business model innovation, especially by responding to the call for more research on the intra- and inter-firm challenges of business model innovation that has been put forward by Berglund and Sandström (2013) and Foss and Saebi (2017). We have organized the development of the conceptualization in an abductive stepwise fashion, where initial empirical insights have been interpreted in terms of overriding perspectives on business model innovation that can be inferred from extant literature. In doing so, our research contributes to the understanding of business model innovation by emphasizing, in line with Laudien and Daxböck (2015), that business models are contextual, which implies the blurring of organizational boundaries as value is co-created among various actors in a networked market (Nenonen and Storbacka, 2010; Storbacka *et al.*, 2012).

In the following section, we discuss the scientific and managerial implications of the findings and contrast these with existing approaches in the research field. Subsequently, we present the limitations and potential avenues for future research. Here, we emphasize the need to consider the macro-, meso-, and micro-levels of business model innovation and the potential contribution from including perspectives from the ambidexterity literature.

Implications

We have argued that business model innovation can occur in contexts of exploitation and exploration across a value network. Thus, business model innovation in collaboration with external stakeholders can be regarded as an approach taken to obtain ambidexterity by balancing exploitation and exploration through domain separation (Lavie, Stettner and Tushman, 2010; Hollen, 2015).

This is an important take-away for managers who struggle with the exploration-exploitation paradox. Ambidextrous organizations have traditionally been perceived as firms with dual structures or a variety of organizational arrangements that facilitate the simultaneous management of exploration and exploitation (Duncan, 1976; Tushman and O'Reilly, 1996; O'Reilly and Tushman, 2013), involving cognitive frames that allow paradoxical recognition (Smith and Tushman, 2005). This implies that ambidextrous organizations are differentiated firms that rely on an intricate balance of coordinating parallel or sequential processes of exploration and exploitation (Benner and Tushman, 2003; Gupta, Smith and Shalley, 2006; O'Reilly and Tushman, 2013). However, as pointed out by Simsek (2009), ambidexterity is not necessarily an intra-organizational phenomenon, but also occurs as inter-organizational arrangements, where ambidexterity is especially strong in cases that imply a high level of manageable diversity in inter-organizational ties. In effect, ambidexterity can be achieved by inter-organizational arrangements, however only to the extent that intra-organizational arrangements facilitate and accommodate the dynamic requirements that the inter-organizational arrangements create.

We argue that the managerial implication of this is that alignment of intra- and inter-organizational arrangements is contextual and changes over time as explorative activities turn into actual implementation that allows exploitation to occur. This implies that in order to be ambidextrous, a firm must possess not only intra-organizational structural and contextual ambidexterity (Birkinshaw and Gibson, 2004), but also the ability to develop and change these properties over time (Markides, 2013; O'Reilly and Tushman, 2013; Papachroni, Heracleous and Paroutis, 2015). The conceptualization of business model innovation that we have derived in the present paper (see Figure 3) can serve as a prescription for how the threshold capability of structural and contextual ambidexterity can be turned into a dynamic capability by utilizing inter-organizational ties to develop domain ambidexterity (Lavie, Stettner and Tushman, 2010; Hollen, 2015). Our conceptualization shows that this can be done through a sequence of steps through which loose couplings gradually become tighter as explorative activities turn into coordinated or internalized exploitative activities. Thus, while the conceptualization presented in Figure 3 presents various instances of business model

innovation, it also presents a generalized pattern of transition from exploration to exploitation, implying that business model innovation occurs both within a framework, i.e., a setup of an exploration-exploitation balance, and along a learning curve. Furthermore, the simultaneous occurrence of instances within the framework implies that inter-organizational arrangements are a viable alternative to intra-organizational arrangements when it comes to facilitating the co-existence of different business logics along the exploration-exploitation continuum.

Limitations and avenues for future research

Based on the theoretical and empirical premises of the current research, we have identified two primary limitations. The first and most central limitation is based on the empirical setting provided by the in-depth study of the logistics intermediary. Due to the fact that the logistics intermediary is required to pursue the objectives of both profit-maximization and regional growth, it is to be questioned whether similar readiness for exploitation and exploration across the value network will be found in private firms.

Second, research following abductive reasoning is influenced by the researcher's theoretical frame of reference (Dubois and Gadde, 2002). Additional central theoretical perspectives, such as network analysis (Granovetter, 1973), have not been included in the current conceptualization. Nevertheless, this could provide a frame for analyzing the construction of inter-organizational networks more profoundly (Gulati and Gargiulo, 1999) and should, along with the following themes, be regarded as an avenue for future research to substantiate the current analysis of value networks and relational theory.

In terms of future research, three avenues are of interest based on additional theoretical input and existing research gaps. The conceptualization proposed in the current paper can serve as a point of departure for studying business model innovation as a process occurring across various contexts for exploitation and exploration in a value network. In doing so, we emphasize the need to consider both the micro-organization level logic of business model innovation in the focal firm, the existing transactional structure of the value network, and the relational links (Santos, Spector and Van Der Heyden, 2009) inherent herein. When widening the scope of business model innovation to include external stakeholders, the concept of meso-level interaction becomes of essence. With inspiration from evolutionary economics, it could be argued that the meso-level must be taken into account when business model innovation of a focal actor affects the organizational context, thus changing the meso-level order, which can in turn have possible repercussions for the macro domain (Dopfer, Foster and Potts, 2004). A future line of research could pursue the levels of business model innovation inspired by a discussion of the micro- and meso-levels of business models, as described by Storbacka *et al.* (2012).

By initiating projects with or aimed at actors not directly included in the current value network, business model innovation goes beyond simple transactions of goods and services. As such, the relational links have to be reconsidered, as intangible transactions of alternative currencies (Allee, 2000) might also influence the reconfiguration. This involves reconsidering the intertwinement of business models and value nets, as Zott and Amit (2008: 3-4), based on Brandenburger and Nalebuff (1996) state: "The players in the value net, such as competitors and certain complementors, may or may not be part of the business model because some of them may not transact with the focal firm." Maintaining this divide can mislead research to overlook relational links currently not supported by transactional activities, thereby dismissing potential avenues of business model innovation.

Finally, additional research is required in order to further explore business model innovation through domain separation as an approach to obtain ambidexterity.

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About the Authors

Louise Kringelum is Assistant Professor at Department for Business and Management, Aalborg University. In 2018 she received her Ph.D. degree in intra- and inter-organizational business model innovation from the faculty of social science at Aalborg University Denmark. She is affiliated to the Center for Logistics and Cooperation in Aalborg, where she has facilitated processes of collaborative business model innovation and studied the development of port ecosystems. Her research interests are in the field of organizational development, collaboration and inter-organizational business models. Email: kringelum@business.aau.dk

Allan Næs Gjerding is Associate Professor and Head of Section at Department for Business and Management, Aalborg University. He has previously served as Dean at the Faculty of Social Science, Aalborg University, and as Vice President at Vestas Control Systems. He is a senior consultant at the Center for Logistics and Cooperation in Aalborg, where he is involved in collaboration between ports and the development of port industrial parks. His current research interests are organizational development, eco systems, and varieties of collaboration, including inter-organizational business models. Email: ang@business.aau.dk

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Home-based Businesses: An Exploration of Business Model Heterogeneity

Isla Kapasi [1] and Laura Galloway [2]

Abstract

Purpose: Home-based business (HBB) literature identifies variation in the sector, such as differences in technology use, knowledge capital. It also asserts HBB may have specific value for specific groups of business starters. Despite this diversity, HBB is treated as one conceptualisation, as a single business model. Consequently, our knowledge is based on disparate studies with different research agendas and results are inconsistent and sometimes contradictory. This paper outlines a means by which the heterogeneity of HBB can be revealed via a framework within which diversity might be viewed.

Method: Largely conceptual, this paper draws from a study of 30 HBB owners to test the framework using the business model dimension of *in* or *from* home and the distinguishing feature example of *knowledge.* The empirical work was qualitative, based on interviews.

Findings: We find variation in HBB types and distinct business models, exposing heterogeneity. The framework provides a means by which the reality of HBB may be better revealed.

Value: Value lies in the provision of a means by which we might view the diversity of HBB. Using the framework, different research agendas may be serviced and afford sight of issues that affect HBB as they vary by business model. This is of value for research clarity, and also for informing policy and support of small businesses as the needs of different types of HBB will vary.

Keywords: Home-based business, micro firms, SMEs, enterprise, strategy

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1 University of Leeds, Charles Thackrah Building, 90 Clarendon Road, Leeds, LS2 9LB, UK, +44(0)1133432611, i.kapasi@leeds.ac.uk
2 Professor of Business & Enterprise, Edinburgh Business School, Heriot-Watt University, Edinburgh, EH14 4AS, UK, +44(0)1314514789, lg1@ebs.hw.ac.uk.

Introduction

Most modern economies have a large micro-firms sector and the majority of these firms are home-based businesses (HBBs) (e.g. BIS, 2015; Walker, 2003). In the UK, for instance, 96 per cent of firms employ fewer than 10 people (Ward and Rhodes, 2014), and the business model of more than 70 per cent of these is to use the home as the business base (BMG Research, 2013). The size and potential value of the HBB sector is, therefore, substantial and this has not gone unnoticed by governments. As a cumulative economic contributor and employer, there is much rhetoric about how to grow this sector (e.g. Business Link, (2012), in the UK; Small Business Administration, (2013), in the USA; Porirua, (2013), in New Zealand). Currently, however, within the research and policy literature, little is known about HBB, particularly in terms of its diversity (or not) with regards to business model(s), context and strategies. In fact, throughout the literature, HBBs are treated as homogenous (Dannhauser, 1999; e.g. Ruiz and Walling, 2005; Mason *et al.*, 2011); an inference applied to their business models also, such that the HBB business model is treated as an archetype (Massa and Tucci, 2013). As a consequence of this, meaningful information for policy and practice and the opportunity to develop robust theory and research within this proportionately large part of the business sector continues to elude us. To support the sector appropriately and thereby make best use of it as an economic asset, a more sophisticated understanding of HBB business models is required. This study addresses this gap.

The contribution of this paper, therefore, is its examination of the components of HBBs that contribute to the creation and capture mechanisms of HBB business models. Despite the general use of 'HBB' as a homogenous business model form, we find that by recognising HBB as a heterogeneous phenomenon, we enhance our theoretical understanding of the relationship between HBB strategy and business model iterations. Thus, we establish that HBB business models are in fact metamodels (Massa and Tucci, 2013) as a result of the individual owner choices and subsequent consequences for their business. Moreover, we contribute to calls from the research community regarding the value of inspecting and classifying business models (Lambert, 2015).

The paper beings with a review of business model and HBB literature, outlining inconsistencies in ontology and research that are obscuring understanding that might inform knowledge, policy support and practice about and for HBB. In response, a conceptual framework, supported by empirical data, is proposed which aims to improve clarity and understanding regarding the intersection of dimensions with different value creation/capture within the HBB. Finally, the value of this more granular representation of HBB is discussed, including implications for those who support HBB, along with opportunities for further research, including theoretical and empirical engagement with broader study of work in society.

Business Models

According to Porter (1996), firms must seek continual value creation/capture opportunities in order to remain sustainable. The e-commerce era saw the development of interest in business models (Magretta, 2002), in particular in terms of scrutinising the effects on value creation and capture in firms (value most often understood as financial profit Osterwalder and Pigneur, 2002a; Hedman and Kalling, 2003; Teece, 2010). A firm's business model articulates its primary purpose (e.g. Amit and Zott, 2001; Sirmon *et al.*, 2007; Pitelis, 2009; Demil and Lecocq, 2010) and acts as an expression of firm strategy (Hedman and Kalling, 2003). Most simply, Margretta (2002) describes a business model as the story of an organisation; its "core logic" (Seddon *et al.*, 2004, p.426; also Shafer *et al.*, 2005), as it expresses the interrelations and configuration of organisational components (Baden-Fuller and Morgan, 2010). Key features of a business model include a firm's its inward (Seddon *et al.*, 2004) or outward-looking orientation (McGrath, 2010); the approach to sustained or temporary competitive advantage (Kujala et al., 2010; McGrath, 2010, respectively); the intersection or separation of the creation and capture of value (Amit and Zott, 2001; Osterwalder and Pigneur, 2002a); and links "a firm's resources and functions and its environment" (Mansfield and Fourie, 2004, p.39). Thus, the business model of a firm allows it to operate optimally within regards to its specific contextual conditions. While all business models include the same components (Osterwalder and Pigneur, 2002b), Baden-Fuller and Morgan

(2010) consider them to be organisational specific, thus heterogeneous by their very nature (also Teece, 2010; Leavy, 2010; Chesbrough, 2010).

Furthermore, innovation, which is vital to firm creation and survival and for value creation/capture to occur (Chesbrough, 2010), may drive new business model configurations (Pitelis 2009). As such, business models are flexible (McGrath, 2010) especially in dynamic business environments (Pitelis, 2009) and are refined over time (Teece, 2010; Morris et al., 2005). Refinement in particular occurs in circumstances of macro-environment change, in industries/sectors with stiff competition, when entering new markets (London and Hart 2004), and when maximum value configuration is required (Demil & Lecocq, 2010). Moreover, although strategy and business models are not synonymous (Casadesus-Masanell and Ricart, 2010), they are highly integrated as a firm's strategy often informs business model creation and development (Osterwalder *et al.*, 2005; Gambardella and McGahan, 2010).

However, business models remain poorly understood (e.g. Morris *et al.*, 2005; Johnson *et al.*, 2008; Kujala *et al.*, 2010), and particularly so amongst microbusinesses. In the context of HBBs – the focus of this paper – to date there is no specific exploration of business models. This paper provides some initial contribution towards addressing this gap, and it is to the extant literature on HBBs and, in particular factors related to business models, that we now turn.

Heterogeneous or Homogenous? The Issue of Business Models in Home-Based Business

The world of work and where it occurs is changing. Examples of this include an increase in teleworking and greater availability of flexible working (Cifre *et al.*, 2002; Garrett and Danziger, 2007; Vilhelmson and Thulin, 2016). Self-employment and independent business activities are also increasing, and this includes a rise in HBB; recent figures from Scotland, for example, show an increase in HBBs of more than 20 per cent between 2012 and 2015 (The Scottish Government, 2015). As a consequence, HBB has begun to emerge as a field of increasing interest, both to researchers (Beach, 1993; Deschamps *et al.*, 1998; Van Gelderen *et al.*, 2008; Kapasi and Galloway, 2016), and to policy makers (e.g. Jones, 2012; Enterprise Nation, 2014), reflecting an interest in developing and supporting the sector, and encouraging this particular mode of self-employment and business.

Empirical studies exploring HBB have been conducted in several, generally Western, economies, for example,(e.g. USA Loscocco and Smith-Hunter, 2004; Canada Bryant, 2000; Australia Nansen *et al.*, 2010) in Australia. Most prolific are studies based in the UK. These studies cover a range of research themes., including the effects of technology diffusion (Daniel *et al.*, 2014; Ruiz and Walling, 2005); urban or rural context (Dwelly *et al.*, 2005; Newbery and Bosworth, 2010; Reuschke and Mason, 2015); housing stock (Reuschke, 2016) and gender (Ekinsmyth, 2013; Thompson *et al.*, 2009). Whatever the focus however, HBBs are largely treated as homogenous entities in empirical studies. The location of where HBB activity occurs provides an exemplary illustration.

Empirical examination of the location of HBB business activity is subject to disparate sources of data and definitions of HBB. To illustrate, three empirical studies are described, though this is not exhaustive. First, Thompson et al. (2009) use Global Entrepreneurship Monitor data, basing their measurement of HBB on nascent and start-up activities in the home. Elsewhere, Felstead et al. (2000) base their study on the 1998 Labour Force Survey that explores those who work mainly, sometimes or partially at home (both employed and self-employed), thus not separating employment and self-employment status. Finally, Dwelly et al.'s (2005) longstanding definition of an HBB still underpins much research (e.g. Ekinsmyth, 2011; Mason and Reuschke, 2015). Here HBB is defined as "any business or self-employed person that uses a residential property as a base from which they run their operation – consciously doing so instead of running a separate workspace/shop/office" (Dwelly, et al. 2005, p.4). Here the home is described as a *base* rather than the location of the work. As a consequence of definitional discrepancies, research findings tend to vary considerably by study, and these inconsistencies can refer to the businesses, the owners, or both. Each of these issues is explored in turn below.

Business components

There are some commonalities between studies of HBB. Loscocco and Smith-Hunter (2004) and Walker (2003) report concentration of HBBs in business services for example. Additionally, HBBs are found in several studies to have low levels of initial capitalisation, have lower growth ambitions than other firms, and are likely to have few or no employees (e.g. Newbery and Bosworth, 2010; Thompson *et al.*, 2009; Walker, 2003). These commonalities are also found for micro-firms generally (e.g. Young, 2013), and so it is no great surprise that these apply in the HBB context. Other findings throughout the HBB literature diverge though.

First, there is variation in the value capture of HBBs. Studies such as Mason et al. (2011) and Ekinsmyth (2011) find that income generated in a HBB is unlikely to be the only or main source of household income, instead being supplementary to households. Alternatively, Walker (2003) finds that the HBB was the major income source for 72 per cent of the male operators and 50 per cent of the female operators in her Australian sample. Second, value creation based on the *type* of work conducted in HBBs, further reveals disparities. For example, several studies report a predominance of either knowledge work (Ammons and Markham, 2004; Crosbie and Moore, 2004; Jurik, 1998) *or* low-skilled activities (Office of the Chief Economic Advisor, 2015; Newbery and Bosworth, 2010; Walker, 2003). Findings about the importance and use of technology for HBBs as a value creation component are also mixed. For example, Wynarczyk and Graham (2013) conclude that technology has "reframed the concept of 'home economics'" (p.451), whereas, Kapasi and Galloway (2016) and Mason et al. (2011) report that in many cases technology use is resisted and the importance of e-commerce is overstated.

In addition, location of the firm (i.e. *at* or *from* home) emerges as a diverging business model component. In many cases, business *in* and *from* home are not discrete, with some work conducted in the home, such as accounts and marketing, and other work, such as transaction or service, provided outside the home, as is the case for tradespeople, for example. Elsewhere, at the other extreme, for some the home *is* the business; several authors focus on the experiences of B&B owners for example (e.g. Di Domenico, 2008; Felstead and Jewson, 2000; Newbery and Bosworth, 2010). Fundamentally, therefore, we can see that both *in* and *from* home emerge as potential distinguishing features of disparate HBB models.

Owner components

HBBs are often operated in a self-employment capacity to 'employ' one person: the owner. Consequently, in the case of HBBs, the owner is 'embedded' in the business model of their HBB. For example, there is some assertion that HBBs are a desirable employment option for some group. Women with dual responsibilities for domestic and economic life are one such group, where the flexibility of HBB can afford the ability to service both roles (Walker and Webster, 2004); White, 2008; Kirkwood and Tootell, 2008). The competing demands of home work and market work will have an impact on the business model adopted.

Human capital, when applied to HBB activity, is another largely unexplored feature of HBB ownership, despite research finding that HBB owners have higher levels of educational attainment than non-HBBs (e.g. Jurik, 1998; Felstead *et al.*, 2000; Mason *et al.*, 2011). Referring to both formal and informal acquisition of knowledge and skills, the level of human capital *required* of a business will have an effect on the business model applied. Some studies find HBBs to be knowledge-intensive (Walker, 2003), thereby requiring high levels of human capital. Other studies find that HBBs are characterised as businesses that require low levels of human capital (Newbery and Bosworth, 2010), implying lower knowledge and skills requirements.

In the employment context, the human capital level of individuals tends to correlate with the human capital requirements of their job (Burton-Jones, 2001). In concert with this, throughout the HBB literature the human capital requirements of firms are assumed to be in line with the human capital of owners. Kapasi and Galloway (2016) however, find this assumption unsafe since there was evidence of a lack of correspondence between *human capital attainment and human capital requirements* amongst some of the HBBs included in their UK sample, with some, particularly lower human capital-based firms, run by people with high levels of educational and skills attainment.

In addition to the possible business and owner components of HBB business model(s), we propose that various and disparate antecedents to, and outcomes sought of, HBB will also contribute to the business model employed. These antecedents may be internal (i.e. related to the individual or business decisions) or external (i.e. related to environment or context), and some examples are given below.

Internal antecedents

People who start a business or become self-employed in response to a perceived market opportunity may choose to base their business – at least initially – at home. There is some evidence that in initial stages, many firms base their firms at home for cost-saving reasons (Herrington and Kew, 2017); a value component significant to business model development (Malmstrom and Johansson, 2017). Upon establishment and a period of sustainability some of these business may move on to an external location, but others may continue to locate at home. In addition, the establishment and operation of a business from home can provide for some a flexible work option. In addition, as noted already, people with caring responsibilities, and mothers in particular, have been identified as a group whose caring and work roles can be facilitated by this model of business as it allows them to combine their dual roles (Ekinsmyth, 2011). Other groups with competing home/life priorities, such as people with long-term health issues, might be similarly motived to HBB.

External antecedents

Employment norms in some industries are based on the HBB model; consider the employment context of farming, some forms of hospitality, or most of the building trades for example (ONS, 2014). These norms can shift over time and indeed, some sectors have increased their proportion of self-employment, and particularly that based at home, as a consequence of structural changes in the employment market (Baldry et al., 2007); Perrons (2003) finds an increase in contractual home based employment in her study of new media for example. Additionally, as employment has become increasingly precarious throughout the last few decades – as 'jobs for life' have been replaced by 'portfolio careers' in many industries (Templer and Cawsey, 1999) – the 'gig economy' has emerged. Friedman (2014) describes the gig economy as that characterised by a series of gigs – short-term contracts, periods of employment and self-employment. Similar to the idea that work is now more akin to a series of projects, the gig economy is likely to involve greater use of resourcefulness for work, including the use of the home for reasons of cost and convenience alongside lack of alternatives (Wynarczyk and Graham, 2013).

These disparate rationales for HBB may have specific effects on operations and performance, but have not received systematic investigation in the literature. Instead, our knowledge of the sector is inferred from a range of studies of HBB that have been prompted by different research agendas, and HBB is still referred to as if it is a single business type, operating as a distinct business model. Consequently, the potential for understanding value creation and capture within this large sector of many economies remains hindered.

We argue, therefore, that a central problem in terms of understanding HBB is the treatment of it as an archetype business model, even where there is acknowledgement of heterogeneity in the rationale underpinning empirical work (e.g. Mason *et al.*, 2011). Consequently research outcomes, whilst considered implicitly generalizable, are in fact limited at best. This in turn compromises ability to inform policy and practice, and indeed, scholarly enquiry. In particular, the distinction between *in the home* and *from the home* is a critical one. Other distinguishing features of the value capture and creation approach are also likely to have an impact on encouragement, support and resource needs and on the capacity of a HBB to prosper and grow. These may include the extent to which technology might enable the business, the personal lifestyle needs of the owner, the knowledge capital of owners, and the knowledge requirements of the businesses.

A means of exploring the heterogeneity of business models amongst HBBs is thus required, and in the next section we propose a framework to that end. This is not the first attempt to draw distinctions between types of HBB. For example, Newbery and Bosworth (2010), Reuschke (2016), Walker and Brown (2004), and Shaw et al. (2000) have all identified that differences between HBBs exist. These previous categorisation approaches have all focused on demographic or industry sector categories though, such as variation by

gender or within agriculture. They have not explored HBB within the wider economic landscape. Our framework is described in the next section.

A Home-Based Business Strategy Framework

The framework presented in Figure 1 is framed within the entrepreneurship paradigm, distinguishing independent business operation from employee status. Relating the framework to entrepreneurship seems reasonable based on the interpretation of 'entrepreneurship' as business ownership or self-employment, as per studies such as the Global Entrepreneurship Monitor (for example Xavier *et al.*, 2013). In concert with Felstead and Jewson (2000), Newbery and Bosworth (2010) and Wapshott and Mallett (2012), the framework makes a distinction between *in* and *from* the home. This dimension is a crucial factor in the value capture of a HBB business model.

Figure 1 presents on its X-axis the distinction between work *in* the home and work *from* the home. HBBs may be categorised here as a point on a range, rather than as a binary choice between *in* and *from*, to acknowledge the diversity of experience between these points. A B&B for example is entirely based in the home, while an accountant may do some work in the home and some work in external locations (e.g., clients' offices). A self-employed translator might do all their trade in external locations (e.g., hospitals) but use the home as the business address and manage accounts and marketing, for example, in the home. The Y-axis refers to some feature for inspection within HBB contexts. The framework thus affords sight of distinct models of HBB from which to engage in further inspection. Figure 2 provides an example framework based on the distinguishing business model component of *knowledge required for the business.* Given that previous HBB literature reports HBBs as operating within the knowledge/services sector (Walker, 2003; Dwelly *et al.*, 2005; Newbery and Bosworth, 2010), knowledge (attainment and requirements) appears to be a central constituent of the HBB construct.

The framework illustrated in Figure 2 provides four related but distinct quadrants for inspection of HBBs in terms of their business-offering knowledge requirements. Lines between quadrants are not rigid; rather they are permeable to illustrate the non-arbitrary nature of the distinctions between each, that the framework incorporates ranges rather than categories. Using this framework it is possible to observe variables within. To exemplify we draw from a study of 30 HBBs. In this case, we use the framework illustrated in Figure 2 that distinguishes *knowledge requirements for the business* by the *in* or *from the home* business model. The methodology we employed to test this framework is described in the next section.

Methodology

The data used here to test the framework was collected as part of a larger study of UK HBBs. The sample was purposively sourced in order to assess the differing components of HBB business models with particular reference to the *at* or *from* home aspect of business operation. Personal networks, social media and national business centres and some subsequent snowballing were employed to reach the sample. As per Stake (2010), qualitative data was collected

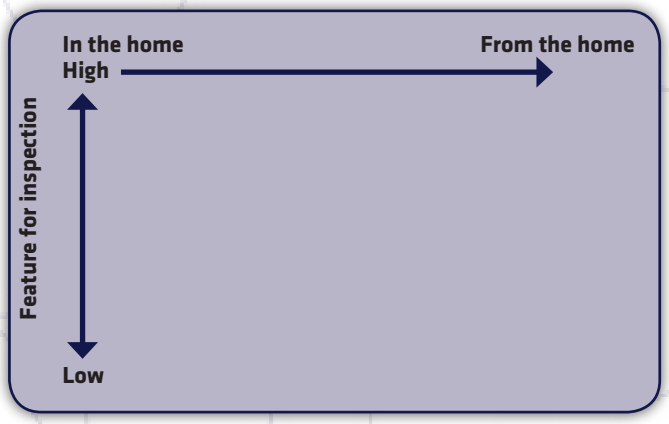

Figure 1: Basic HBB model framework

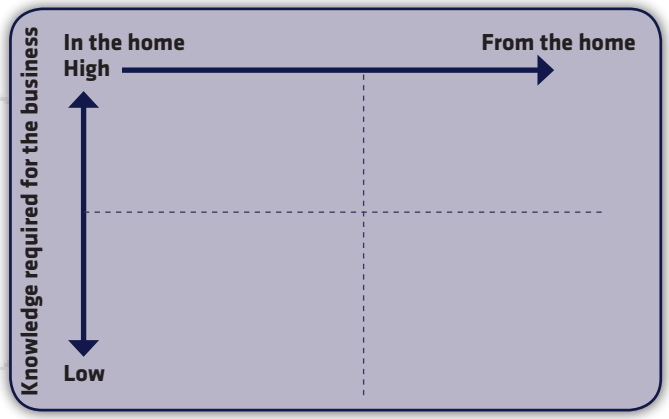

Figure 2: In/from the home by knowledge requirements

through in-depth, semi-structured interviews, which lasted between 30-75minutes, and included information about both the owner and the business. Interviews were conducted at mutually agreed locations and times, and interviewees were assured confidentiality and anonymity. The sample included 30 participants of whom 13 were male and 17 female. This was a well-educated sample, with 24 participants having first degree or higher levels of qualification. Summary data about the participants is given in Table 1.

Participant	Gender (M/F)	Age (Y= >45; O= <45)	Business
1	F	Y	Translation
2	F	Y	Jewellery manufacture
3	F	O	Translation
4	F	O	Artist
5	F	O	Pilates instructor
6	F	Y	Toy manufacture
7	F	Y	Mobile hairdresser
8	F	Y	Retail
9	F	Y	Artist
10	F	O	Retail
11	F	O	Food manufacture
12	F	O	Spiritual advisor
13	F	Y	Accountant
14	F	Y	Accessories manufacture
15	F	Y	B&B
16	F	O	Retail
17	F	Y	Training consultancy
18	M	Y	Translation
19	M	Y	Media freelancer
20	M	Y	Retail
21	M	Y	Management consultant
22	M	Y	IT
23	M	O	Management consultant
24	M	Y	Software developer
25	M	O	Training consultancy
26	M	Y	Property rentals
27	M	O	Telecommunications
28	M	U	Social media advisor
29	M	O	Draughtsman
30	M	Y	Musician

Table 1: Summary sample information

Gender	M=Male
	F=Female
Age group	Y= under 45
	O= over 45
Knowledge capital (owner)	H=Higher Education
	N=No Higher Education
Examples	Male under 45 with higher education = MYH1
	Male over 45 without higher education = MON2

Table 2: Key to figure 2

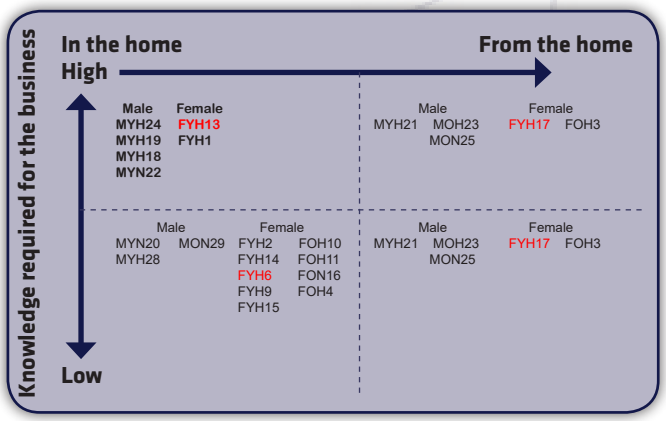

Figure 3: Mapped sample In/from the home by knowledge requirements

The 30 HBBs from which participants were drawn are plotted in Figure 3 and a broad idea of demographics, while not intended to imply representativeness, is provided for information by the use of nomenclature described in Table 2.

Analysis

While the data required for plotting within a framework comprises specific, discrete features (such as age, gender, education attainment level), interview content was also of use. Eisenhardt (1989) stresses the use and utility of qualitative data to afford insight and theoretical development. In line with this, while discrete items were important in terms of the plotting of different HBBs and HBB owners into the framework, the interviews provided rich and nuanced context to each case. Figure 3 affords us some sight of the nuances of different HBB models in terms of the knowledge requirements of the firms.

While this study was entirely qualitative and so none of the data plotted in Figure 3 can be said to be representative of the HBB sector, it does illustrate several things about the sample. First, HBBs span a wide range of industries and heterogeneity is observable (as demonstrated by information in Table 1). This sample is also illustrative of older and younger, male and female HBB ownership. In terms of knowledge requirements for the firms, there is a clear range, from technology and professional knowledge required through to low knowledge requirements (as illustrated by the spread of business types mapped in Figure 3). In this sample it is clear that there is no direct link between knowledge capital of the owner and knowledge requirements for the business; in particular, amongst those firms with least knowledge requirements we have owners with high levels of knowledge capital, and indeed, some representation of the opposite, with an unqualified IT consultant operating in this high tech knowledge sector for example (as defined by Standard International Trade Classification (United Nations, 2006). This may suggest a research agenda concerning the use of self-employment to mitigate lack of formal qualifications in knowledge sectors (where it may be difficult to obtain employment without requisite education). There is certainly a research agenda implied in terms of exploring why some highly educated people develop HBBs in low knowledge sectors.

To illustrate further heterogeneity and to engage with the theory that HBB is particularly suited to those who require flexibility of home and work life, a 'common group' was selected for particular inspection. This group was 'mothers', and the choice of these was based on assertions throughout the research and policy literature that HBBs are a convenient and useful way of combining the dual roles of motherhood and work (Walker and Webster, 2004). To explore this, we applied an 'ideal types' analysis. Weber (1904) proposes that ideal types inform typologies and represent abstract concepts that derive from the characteristics and elements of the object of study. To this end, by selecting one instance of the 'type' from each quadrant, diversity can be revealed, and theoretical development enabled (Eisenhardt, 1989; Eisenhardt and Graebner, 2007). In this case, the ideal type selected from each quadrant had the common characteristics of being female, having higher education and being the primary carer for young children. A vignette for each is presented below.

Case 1 – High knowledge/skills requirement + In the home

FYH13 is a qualified and chartered accountant with several years of experience working for one of the largest accountancy firms in the UK. She decided to become self-employed when she found commuting too inconvenient and time-consuming as she tried to manage full-time work and looking after her children. She chose to create a HBB because it is possible to do this in her industry and it would reduce her commuting time.

Case 2 – High knowledge/skills requirement + From the home

FYH17 is an environmental consultant and auditor with two young children. She is educated to Master's degree level. Consultancy is a norm within her industry sector. Her self-employment registered address is her home address, however, she conducts all of her customer facing work in the buildings of the contracting organisation. She chose to start a HBB because this was the most cost effective business model available and would allow her to spend more time at home with her family.

Case 3 – Low knowledge/skills requirement + In the home

FYH6 is educated to degree level and has had several jobs in industry in the field of marketing. She makes memento toys for parents from the outgrown clothes of their babies and children, a business selected on the basis that she could operate it at home while caring for her two young children. The HBB model also allows her to keep costs low.

Case 4 – Low knowledge/skills requirement + From the home

FYH8 is a mother of two with a Masters qualification in Human Resource Management. After graduation she found it hard to find work and was turned down for several positions. Shortly after she had her first child, she became self-employed in order to balance childcare with the continued requirement to work. Consequently, she began selling household cleaning products door-to-door, and she manages her accounts and other administrative functions from the home. The HBB model enables her to keep costs low, she can choose her hours flexibly, thereby suiting her life requirements.

Discussion

The proposed framework offers both theoretical and practical contributions. First, from a theoretical development perspective, this study advances a HBB business model framework which elucidates the importance of two key dimensions that are integral to the value creation and capture components of HBB: *in* and *from* the home, and the example variable of *knowledge requirements of the business*. This advancement of HBB theory may be especially valuable in light of changes to work in society norms. The framework also allows that causal relationships between dimensions may be tested. This offers potential to inspect how changes to work in society norms affect 'working' behaviours and expose (possible) unintended aspects of these, with particular reference to the importance of environmental factors for business model development and innovation (Mansfield and Fourie, 2004; Pitelis, 2009). The dimensions, which refer to value creation/capture components, made visible by the framework provide conceptual clarity in order to see a diversity of issues, experiences and needs within the heterogeneity. For example, based on findings in the employment literature, an increase in the numbers of HBBs in the *high knowledge/skills requirement outside the home* quadrant might be anticipated in response to structural change such as increased contractualisation of knowledge workers (e.g. Baldry et al., 2007). Equally, an increase in HBB owners may also be expected in the *low skills outside the home* quadrant as a result of changing industry norms such as the 'gig economy', that is, temporary short-term engagements with organisations. These two broad contexts of HBB have different support requirements, and implications for policy and scholarly research.

Inspection of *low knowledge requirements within the home* businesses provides a clear example of the value of the framework developed in this paper. Previous research has found that those opting for the kinds of businesses included in this group may do so due to low barriers to entry (Loscocco and Smith-Hunter, 2004; Mason et al., 2011; Thompson et al., 2009). In addition, these businesses operate in highly competitive markets and may have "little power to determine payment and deadlines, and are often reliant on a small number of clients" (Thompson et al., 2009, p.228). Consequently the importance of understanding this quadrant is considerable given that competitive advantage is central to firm survival (Porter, 1996), and this is facilitated (or not) by the business model adopted (Hedman and Kalling, 2003; Teece, 2010). The support implications for this type of HBB are not similar to those in other quadrants though. Further, conventional wisdom would locate those with low skills levels in this quadrant, but as illustrated by the sample used for this paper, this is an unsafe assumption, with evidence of low skills businesses operated by people with high human capital. Skills development support needs to engage with actual rather than assumed knowledge and skills levels of those operating HBBs in any of the quadrants identified if it is to be most effective.

The framework also provides a basis on which to test integral dimensions, assess similarities and differences in what is often a homogenised understanding, or representation, of HBB (refer to Massa and Tucci, 2013, for a discussion on business model archetypes). In this paper we used *higher education* and *mother* as constants and found evidence of HBBs facilitating dual roles. The evidence was not consistent to one model of HBB though, and representation in each quadrant was found. This suggests that even where the value capture purpose of the HBB is consistent (from the perspective of the individual owner) – in these cases to facilitate dual roles and keep costs down – neither the experiences of the owners nor the types of HBB business models they adopted for this are homogenous and as such have different support and resource requirements. This clearer view of the differences between HBB models for working mothers might afford tailored and most effective support for their disparate HBBs. Other examples of the affordance of greater inspection may be the much-asserted utility of technology for HBBs; this is especially pertinent given that the importance and use of technology may well vary between the quadrants. Another might relate to business scale, providing a better idea of which types of HBB are represented by those who are self-employed and those who are employing others (and in either case, those that have the potential to grow). The framework also provides a way of classifying a HBB that, by recognising the issue of heterogeneity, makes the ability to compare like with like more feasible. This affords a more precise understanding of different types of HBB, with which to inform research activity, policy and those who seek to support HBB.

To summarise, our framework illustrates that HBBs exhibit different business models based on their approach to the creation and capture of value. Therefore, based on the differing categories that they occupy, HBBs are observable heterogeneous; they represent, in fact, meta-models (as per Massa and Tucci, 2013). Recognising broad distinctions will enable future research to examine variation between the business models employed, and key issues that affect the different business models (for example technology and lifestyle factors). This may allow for the nuance required to understand additional issues in the HBB landscape such as work-life balance, for example. From these more refined categories, better-focused research to understand issues and explore experiences may be achieved. From there, better understanding can develop and be used to inform support and policy agents. Furthermore, this research provides a conceptual framework from which we can theorise abstract factors which are likely to be embedded in the structure of HBB business models such as social class, social status, gender, intellectual, social and financial capitals and opportunity recognition/discovery.

Conclusion

This paper has paid specific attention to the complex issue of activities classified as HBB. The study builds on existing HBB classifications such as those developed by Newbery and Bosworth (2010) and Walker and Brown (2004). This study develops insights into the value creation and capture approaches taken by HBBs. We demonstrate that for HBBs, the distinct category of location, that is *in* and *from* home may be viewed together with other business model components, to inform future research, including for the purposes of theory building as per Eisenhardt (1989). In this case, while the theoretical assertion of the role of flexibility of HBB ownership can be useful for mothers is supported, the expression and type of HBB ownership is seen to vary considerably and as such, suggests heterogeneity of experience s within this group rather than homogeneity.

The implications of this study for policy and practice are considerable. First, the number of HBB activities across the developed world appears to be continuing to increase. Thus, awareness of this trend within support agencies is advised. Second, the framework indicates that HBB is heterogeneous, including different business models. Therefore clarity around the support offering for the different activities that are currently labelled as HBB would be beneficial. In particular, even amongst specific groups or for specific purposes, as illustrated in this paper by the example of working mothers, it is not safe to assume business model homogeneity. The potential of supported business development activities specifically for HBBs across different business models will be valuable. Finally, with regards to practitioners, an awareness of the aspects of different HBB business models as per this framework would be beneficial as it may help those businesses and owners to alleviate some of the challenges identified.

As with all studies, this study has limitations. First, the complexity of the existing research base is hard to reconcile given the heterogeneity of organisations studied. Second, this paper provides only limited examples of the components of HBB that may be studied. This provides an opportunity for future research in the field to identify and map additional ones (e.g. technology, key partners, *owner* value propositions (i.e. lifestyle factors)). Third, this study comprises a snapshot in time in terms of the HBBs studied and decisions regarding each firm and its business model may be realistically expected to change over time as per business model theory (Morris *et al.*, 2005; Teece, 2010). This is an aspect worthy of future research. Finally, this study has not addressed all of the business and owner characteristics of HBBs. Given that HBBs are often solely owner-led, there is room for future research to examine how business models intersect with specific owner/business-related components and whether these constructs are discrete or overlap in the study of HBB.

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About the Authors

Dr Isla Kapasi is a Lecturer in Entrepreneurship at the Centre for Enterprise and Entrepreneurship Studies in the Business School at the University of Leeds. Her research interests include entrepreneurial diversity, micro firms and the motivations and experiences of entrepreneurs. She has published widely on these topics.

Professor Laura Galloway, PhD, is a professor of business and enterprise at the Edinburgh Business School at Heriot-Watt University. She specialises in research in diverse contexts and entrepreneurial diversity. She has published widely on SMEs, entrepreneurship, leadership and education.

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Emerging Revenue Models for Personal Data Platform Operators: When Individuals are in Control of Their Data

Laura Kemppainen[1], Timo Koivumäki[2], Minna Pikkarainen[3] and Antti Poikola[4]

Abstract

Purpose: This paper identifies emerging revenue models for personal data platform operators that facilitate the exchange of resources between an individual and a service provider for their mutual benefit. Context of this study is human-centered personal data management, which refers to individuals being able to control the use and access of their personal data for third-party services.

Design: This research is conducted by analysing qualitative questionnaire data from 27 organizations from 12 different countries that are considered as forerunners in creating services in this context.

Findings: Our study shows that personal data platform operators capture value with transaction-, service-, connection- and membership fees from service providers, data sources and individuals using the platform. This study also reveals two propositions as the foundation of revenue model creation in the context of human-centered personal data management, namely a no-advertising and free-for-users model. Our research findings show that monetising personal data with advertising is avoided by personal data platform operators.

Research Limitations/Implications: This study calls for further research about how does providing control over personal data to individuals influence on business models of platform operators and other service providers in the market.

Practical implications: For practitioners, this research offers new insights on revenue models that are being developed by the forerunners of human-centered personal data management approach in the European market.

Originality/Value: Revenue models for personal data platform operators when taking a human-centered approach to personal data management. Propositions to consider when creating revenue models in this context.

Keywords: revenue model, personal data, platform operator, value capture, human-centered personal data management, multi-sided market

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1 Martti Ahtisaari Institute of Global Business and Economics at the AACSB accredited Oulu Business School, Finland

2 Martti Ahtisaari Institute, University of Oulu Business School.

3 VTT Technical Research Centre of Finland and University of Oulu / Oulu Business School, Martti Ahtisaari Institute and Faculty of Medicine

4 Aalto University.

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Introduction

The increasing use of online and mobile services has enabled large technology companies to collect tremendous and growing amount of personal data (Rehman et al., 2016; Gandomi and Haider, 2015). Many companies offering digital platform services base their business models mainly on offering individuals with free services and in return collect personal data on the platforms (Weber, 2015; Muzellec et al., 2015). In other words, platform revenue models are relatively business-to-business oriented and the end-users are, in fact, argued to be part of the value proposition for business customers such as advertisers (Muzellec et al,. 2015). At the same time, discussion and concerns about data privacy (Vescovi et al., 2015, Spiekermann and Novotny, 2015) and proper use of data (Roeber et al., 2015) are increasing. Moreover, individuals are becoming increasingly concerned about the limited interoperability that decreases value for them (Kshetri, 2014). Also, when data is being locked in databases (de Montjoye et al., 2012) the opportunities for gaining a holistic view of the data collected and exploiting the data can be limited (Vescovi et al., 2015).

In this study, a term personal data platform operator refers to a digitally enabled service platform that facilitates the exchange of resources (Lusch and Nambisan 2015). This type of a platform is multi-sided in nature (Evans, 2003; Rochet and Tirole, 2003; Evans and Schmalensee, 2007; Pagani, 2013; Tan et al., 2015) and has designed its business model around the approach of human-centered personal data management (see Pentland, 2012; Wang and Wang, 2014; Vescovi et al., 2015; Poikola et al., 2015). Human-centered personal data management refers to individuals being provided with the means to control their personal data, which is an approach that has the potential to benefit the whole market and enable new business models (Gnesi et al., 2014; Vescovi et al., 2015; Poikola et al., 2015; Papadopoulou et al., 2015).

A settled view in the academia is that a revenue model is a crucial component of a company's business model (see Osterwalder and Pigneur, 2002; Shafer et al., 2005; Schweiger et al., 2016). A revenue model can be described as a plan for ensuring revenue generation for a company (Mahadevan, 2000) or an innovation in how a company generates value (Giesen et al., 2007). It can also serve as a measurement of the ability of the company to translate value created to money for itself (Osterwalder and Pigneur, 2002) or both for the company itself and its partners (Amit and Zott, 2012). In this study, a revenue model is seen as one fee or a combination of fees for different stakeholders, which is a perspective suggested in prior research in the context of multi-sided markets (c.f. Brunn et al. 2002, Kafentzis et al. 2004).

So far, the academic discussion related to massive data collection and utilization has been rather technological and industry-oriented to date. (Shin, 2016). Research has mainly focused on privacy perspectives of data use (Spiekermann and Novotny, 2015; Zissis and Lekkas, 2012; Weber, 2015) or describing the phenomenon of human-centered design (Vescovi et al., 2015), excluding some endeavours on platform revenue models in the context of open data in the field of information and communications technology (c.f. Janssen and Zuiderwijk 2014; Ferro and Osella 2013). However, there is a gap in our understanding on suitable revenue models in the context of human-centered personal data management. Because a business model can become comprehensive as a concept only in a business context (Ahokangas and Myllykoski 2014), this research contributes to platform business model research in filling the gap in the chosen context from revenue model perspective.

Despite the lack of research in the context of human-centered personal data management, studies can be found on revenue models in other multi-sided markets like social networks or 'internet business' (c.f. Lumpkin and Dess 2004; Enders et al. 2008). In this paper, a literature review was conducted by reviewing research in multi-sided markets to gain a base understanding of revenue models for personal data platform operators.

In this study, we describe how a personal data platform operator captures value. In other words, how does a personal data platform operator gain monetary benefits in exchange of value through the variety of revenue models (Richardson, 2008; van Putten and Schief, 2012). This leads to forming our research question: *How does a personal data platform operator capture value with revenue models?*

In the following section, we give a background for this study by describing the concept of a business model, discuss human-centered personal data management and give a literature review on revenue models in multi-sided markets. We then describe the methodology and present the results of this research. Lastly, the implication of human-centered personal data management in personal data platform operator's revenue models is discussed.

Background

Concept of a business model

Because a business model describes how a company conducts its business, it can help in answering to questions who is the customer, what does the customer value and how to capture value i.e. make money in this business? (Shafer et al., 2005). Often a business model is a story that is told to customers and finally transforming the story to revenue (Magretta, 2002). Today, the rapidly changing business environment is continuously creating space for new business models to emerge in addition of reinvention of existing ones. (Voelpel et al., 2004) The companies that continuously evolve their business models gain competitive advantage which is necessary to survive in the dynamic business environments. (Wirtz, et al., 2010) As an example, technology (including the data usage) plays a significant role in many organizations, working as a baseline for the new business model generation (Voelpel, 2004).

Concept of a business model has been the focus of many research over the past few years (Shafer et al., 2005; Voelpel, 2004) and although there have been attempts to define a business model (see Zott et al., 2011) no agreed-on definition or concept exists today. In their broad review of the business model literature, Zott, Amit and Massa (2011) found that business models are many times used in seeking to explain how value is created and captured. Similarly, Shafer et al. (2005) identify four main business model elements i.e. creating value, capturing value, strategic choices and value network, of which value creation and value capture have been identified as core activities under the strategic choices companies need to make.

It becomes clear that in addition to having a strong value proposition to stakeholders, it is critical for a company to have a model that produces revenue to cover the costs and captures the value (Richardson, 2008). Based on Schweiger et al.'s (2016) literature review of 27 articles on platform operators' business model components, revenue model was one of the most agreed elements along with value creation and value proposition. However, many times companies still tend to focus merely on actions that increase value up to the extent that capturing the value is ignored. Eventually, this would lead to being unable to generate revenue from the beneficiaries (Shafer et al., 2005.) To add to the challenge, value capture must be operationalized in such a way that it does not have a negative impact on other indirect stakeholders (Frow and Payne, 2011). Today, as a result of companies shifting from product-based towards service-based ideology, revenue model is more and more about finding new ways for generating recurring returns for the company instead of only selling a product or service (Iivari et al., 2016).

Business model and human-centered personal data management

Studies show that individuals would generally be willing to share their personal data with companies if the benefits and terms were sufficient for them (Roeber et al., 2015). Around this idea, personal data platform operators that offer personal cloud services are emerging to help individual in managing and sharing their personal data (Spiekermann and Novotny, 2015; Vescovi et al., 2015).

As an answer to the growing interest of academia and business towards human-centered personal data management, new frameworks and principles (see Vescovi et al., 2015; Poikola et al., 2015) are being developed to enable individuals to gain control over their personal data. The vision is that personal data should be technically accessible and usable so that individuals could share their data with stakeholders in the ecosystem in return of value. For example, 'MyData principles' state that individuals should be empowered by giving control over data to them. (Poikola et al., 2015) MyData is one approach for human-centered personal data management, which, in a long run, could enable new type of data availability and therefore opportunities for creating new business models (Poikola et al., 2015) for platform operators (Kemppainen et al., 2016) and in the field of preventive healthcare (Koivumäki et al., 2017) as examples.

The shift towards human-centered personal data management and the new market of data has also been

supported by legal means with the European General Data Protection Regulation (European Commission, 2016) and the European Payment Services Directive (European Union, 2017) that set rules for better data portability between platforms and increase individuals' rights to control their personal data. We see that a personal data platform operator is one concrete example of the new role and business model that address to this need.

Revenue models for platform operators

Multi-sided market is a new type of market structure that has enabled the emergence of new services and revenue models (Pagani, 2013) like Facebook, AirBnB and eBay have shown us. Possible revenue and cost models have been studied in e.g. Wang et al., (2014). They state that in a multi-sided market, the cost and revenue can be generated from all sides of the market. However, many times one side is subsidized, which leads to identifying two distinct sides: a money side and a subsidy side, who use the platform for free or may purchase some additional features. In platform business, the subsidy side is often used in attracting the other side like service providers and advertisers to the platform who cover the costs of free users on the other side of the market. (Wang et al., 2014.) For example, in the case of eBay, sellers pay for using the platform and the buyers don't, at least not directly (Pagani, 2013). When individuals are on the 'money-side', a platform operator may charge them for interacting with the platform, both from access and usage (Beyeler et al., 2012, pp. 316–317).

Slightly differing from Wang et al.'s (2014) findings, Muzellec et al. (2015) found out that in the case of platform start-ups, the initial focus of them is to generate revenue from individuals. However, the need for monetization may eventually shift the focus on business customers as the business growths. In this case, possible revenue models can be freemium for businesses, advertising and affiliation (Wang et al., 2014; Muzellec et al., 2015), which means that vendor pays an affiliate fee each time a user clicks through affiliate's website and makes a purchase from vendor (Lumpkin and Dess, 2004).

Multi-sided markets can be divided into non-transaction and transaction markets. (Filistrucchi et al., 2014) In a non-transaction market, there are no monetary transactions between the platform users (interactions may still occur) and a platform operator can generate revenue from people joining the platform. In a transaction market, a platform may generate revenue from people joining the platform as well as people using it, by taking a share of the monetary transactions (Filistrucchi et al., 2014). In a transaction model, a personal data platform operator may generate revenue by enabling or executing a transaction between the users, for example, by selling third party or user-generated content or facilitating transaction (Enders et al., 2008). Transaction fee may also be generated from service providers or individuals when the service provider sells virtual or concrete products to the individual via or on the platform (Wang et al., 2014). Value can be captured for example based on the volume of transactions conducted over the platform (Laudon and Traver, 2007).

Platform operators can also provide convenient and user-friendly access to content on their platform and generate revenue through advertising costs from advertisers, subscription and pay-per-use or provide a cost-efficient exchange place for buyers and sellers in return of direct sales revenues and indirect commissions in exchange of connecting the users (Lumpkin and Dess, 2004; Wirtz et al., 2010). Alternative strategy is to focus on context (like Google) and help users to search for information by increasing transparency and reduce complexity and generate revenue mostly from online advertising. Finally, connection-oriented platform operators enable users to exchange information over the internet. Possible revenue streams could be online advertising, subscription, time-based billing and volume-based billing (Wirtz et al., 2010), of which time-based billing is argued to be less and less used in the future (Enders et al., 2008). In advertising and subscription based revenue models, the key revenue drivers are the number of users and their willingness to pay. In a transaction based model trust towards data handling is the key, which can be ensured with a high level of privacy, for example by allowing users to determine which data they want to share with others. (Enders et al., 2008.)

Other possible model is no free users (NF), meaning that all sides pay for the platform usage in some way. However, Wang et al. (2014) argue that freemium model that generates revenue from only premium users and service providers is more profitable than the NF model from a platform operator point of view in a long run. To challenge the model of NF, a totally opposite

model of 'free for users' is suggested (see Muzellec et al. 2015). One example of the 'free for users' model is the America's first e-billing system. (Edelman, 2015) In this case the company offered individuals with free trials and they got used to the system. Eventually when individuals were asked to pay for it, they did. At that point, when the company already had many paying customers, also companies wanted to partner with the e-billing system, which again attracted more paying individuals. (Edelman, 2015.)

Our literature review resulted with 14 revenue models in multi-sided markets. The revenue models are summarized in Table 1 from the most common ones (advertising) to the rare ones with only one reference, namely volume-based billing, no free users model, direct sales revenue and no advertising model. All in all, from a business model perspective, popularity of the advertising model suggests that revenue is mainly generated from advertisers and for individuals, providing free (or at least very low cost) content is a common value proposition. (Yablonsky 2016). The source of competitive advantage in business models relying on advertising as the main source of revenue lies in platforms enabling better ways to gather and evaluate information related to purchases or providing personalized content to target audiences. (Tucker, 2014). In general, what revenue model(s) companies end up choosing to adapt reflects their strategies in creating competitive advantage, through addressing the customers' needs. (Yablonsky, 2016).

Although the models are presented individually in the table, revenue models are meant to be and can be combined in different ways to achieve competitive advantage (Lumpkin and Dess, 2004). However, Enders et al. (2008) argue that usually one primary source of revenue can be identified. A revenue model can also be changed over time. For example, StayFriends, Germany's biggest social networking platform offered its service for free but when the platform had attracted enough users on the platform, they introduced a subscription model. (Enders et al., 2008.) In the following chapters, we will discuss about the research setting, data collection and analysis and then present the findings. We will finally compare and reflect the literature review with the findings in the discussion chapter.

Authors	**Lumpkin & Dess (2004)**	**Wang et al. (2014)**	**Wirtz et al. (2010)**	**Muzellec et al. (2015)**	**Enders et al. (2008)**
Context / revenue model	Internet business models	Mobile social networks / two-sided markets	Internet business models	Two-sided internet platforms	Business models for social networking sites
Advertising	X	X	X	X	X
Subscription	X	X	X		X
Commission	X		X		
Freemium for individuals		X			X
Freemium for businesses		X		X	
Pay-per-use	X		X		
Time-based billing			X		X
Transaction based model		X			X
Free for users				X	X
Affiliation	X			X	
No advertising model					X
Direct sales revenues			X		
No free users		X			
Volume based billing			X		

Table 1: Revenue models of platform operators in multi-sided markets.

Research design

Qualitative study is appropriate in this research, because it allows us to produce new insights and gaining more understanding about the topic in the specific context (Yin, 2015, p. 9) of human-centered personal data management. However, in order to understand what kind of revenue models are suitable for a personal data platform operator, questions were asked not only from the personal data platform operators themselves but also from other companies that are active in developing the context of human-centered personal data management. Unit of analysis of this study is an organisation that has identified a revenue model for a personal data platform operator. Noteworthy is that since the human-centered approach is relatively new, all the personal data platform operators in this research are start-ups and in a phase of developing their business models. Therefore, revenue models found in this research are not fully tested in the market but are the first attempts on creating business and capturing value in this context.

Research setting and data collection

Data was collected with open-ended questionnaires from 27 companies and organisations from 12 different countries from Europe, the US and Australia that develop, research or offer personal data management services or architectures in the European market. Based on their answers concerning their offering and business model, we identified the following roles: 13 personal data platform operators, 6 ecosystem supporters, 1 public and 2 research organisations, 2 consultancies, 2 technology providers and 1 service provider. The respondents are listed in more detail in Appendix 1.

Data collection was conducted by the European Commission in November 2015 to gain a better understanding about the emerging market of human-centered personal data management in Europe. The questionnaire was designed by a representative from the European Commission with collaboration of an author of this paper who actively participated in the designing of the questions. The questionnaire was sent to companies and researchers that offer personal information management services in Europe or in other way support the emergence of human-centered personal data management. The questionnaire covered questions about the business model, and explicitly about the revenue model as follows.

> Question 2: "Please describe as succinctly as possible your business model and the value proposition."; "Describe below (without reference to external document) the exact kind of service and possible linkages to other services, the benefits for the individual and for companies working with personal information and the revenue model."

> Question 6: "Personal information is the key mode of compensation for a wide range of offerings through the Internet offered at non-monetary charge ('for free') to the individual. Personal information management architectures have a disruptive potential. Also, they come with a cost. What is a convincing business model in order to obtain a return on investment and what are the chances that this business model will be sustainable? Who should be the party financing the value chain (the organisations requiring personal information or the individual?)?"

> Question 7: "Roll-out of personal information management architectures face the problem of two-sided markets (the uptake in the offer of personal information management services depends critically on the expected number of consumers whereas consumers are only likely to use – and pay for? – such services if the offering is convincing to them). How in your assessment will this problem be solved? What is your approach?"

Data analysis

Data was analysed using a coding method that has been found very suitable for conducting qualitative data analysis (see Basit, 2003; Saldaña, 2015). A code means a researcher-generated word or a short phrase that is evocative or capture the essence of the open-ended questionnaire responses (Saldaña, 2015, p. 4). Coding refers to selecting those parts of the questionnaire answers that contain information related to revenue models of personal data platform operators for further analysis. The selected parts of the texts are called quotations and all of them belong to one or multiple codes that are named according to the meaning of the text. Quotations linking to the findings can be found in Appendix 2.

Organisation type	Role in the market	Respondent	Key customers	Country	Code
Commercial company	**personal data platform operator**	CFO	individuals, companies	Switzerland	1
Commercial not-for-profit cooperative	**personal data platform operator**	President	individuals	Switzerland	2
Researcher/ a research organisation	**personal data platform operator**	Not known	individuals, companies	US	3
Commercial company	**personal data platform operator**	Founder	individuals, companies	UK	4
Commercial company	ecosystem supporter	CEO	individuals, companies, business analytics companies	Belgium	5
Representatives of an independent non-profit foundation	**personal data platform operator**	Executive Director	-	The Netherlands	6
Community Interest Company, a social enterprise	**personal data platform operator**	Co-Founder	individuals, companies, business analytics companies	UK	7
Public body	public organisation	Strategic Officer	-	UK	8
Commercial company	ecosystem supporter	CEO	individuals, companies, business analytics companies	UK	9
Non-profit organisation	**personal data platform operator**	CEO	individuals	Spain	10
Commercial company	**personal data platform operator**	CEO	individuals	Denmark	11
Non-profit organisation	ecosystem supporter	Director	companies	UK	12
Commercial company	consultancy	Strategy Director	-	UK	13
Researcher/ a research organisation	research organisation	Senior Researcher	-	UK	14
Commercial company	technology provider	Co-Founder	individuals, companies, business analytics companies	France	15
Commercial company	**personal data platform operator**	Founder	individuals, companies	Austria	16
Commercial company	service provider	Senior Researcher	individuals	Spain	17
Researcher/ a research organisation	ecosystem supporter	Researcher	-	US	18
Researcher/ a research organisation	research organisation	Senior Security Architect	-	Denmark	19
Non-profit think & do tank	ecosystem supporter	Not known	-	France	20
Public body	ecosystem supporter	Personal Data and Trust Lead	-	UK	21
A researcher/ a research organisation & a business consultancy company	consultancy	President	individuals, companies,	Italy	22
Commercial company	**personal data platform operator**	Founder	individuals, companies	Australia	23
Commercial company	**personal data platform operator**	Senior Researcher	individuals, companies	Italy	24
Commercial company	**personal data platform operator**	Founder	Other- We build relationships	Australia	25
Commercial company	**personal data platform operator**	Co-Founder	companies, individuals	Belgium	26
Commercial company	technology provider	Vice President	companies	USA	27

Appendix 1: Respondents of the open-ended questionnaire.

Revenue models (Themes)	Short explanation	Example (company code after the citation)	Revenue source	Codes used in the analysis
Transaction fee	1) Fee for data transaction 2) Fee for data transaction if an individual is paid to or charged	*1) "The costs of operating the platform need to be covered by fees from partners needing a compliant and user accepted health data storage solution; fees from facilitating data exchanges" (1)* *1) "Users who agrees to share their data for the offered benefit/reward, sign-up for the research project. Once the total number of required participants have signed-up and the appropriate data has been shared, the users will receive the offered benefit/reward. [the company] receives a transaction fee from the researcher for facilitating the above mentioned interaction as well as handling the transfer of the benefit." (1)* *1) "If a user agrees to exchange data for value (service, convenience or reward) then the business pays a "postal fee" to [the company] in the order of $0.10. This postal fee is the strategic business model and when introduced will result in the app being 100% free to users." (4)* *2) "Organisations (...) if generating income through the provision of services, sale or purchase of data pay a small transaction fee" (7)*	- Service provider	• 100 % financed by end-customers • ad-financed platform • annual support fee • basic features for free • charge individuals a fee • charging for an engagement • citizens to determine valuable models • collecting and selling anonymized data to clinical studies • combination of models • commission model • business model for competitive ecosystem • concrete revenue models within network • connection fee • cooperative membership share • cuts from app store like system • transaction fee • documentation available free of charge • end of ad-funded internet

Appendix 2: Revenue models, propositions behind them and citations from the data.

Revenue models (Themes)	Short explanation	Example (company code after the citation)	Revenue source	Codes used in the analysis
Service fee	1) Freemium basis 2) Service bundle 3) Fee based on the savings realised by the individual	*1) "Platforms directly financed by the users: Users pay for the services provided by the platform, in the form of subscription or service fee. Platforms are operated by private companies (for profit)." (10)* *1) "The other primary end-users are of course the healthcare providers (hospitals, specialists, general practitioners), who can be attracted through a freemium approach, i.e. by prompting them to pay for using specific functionalities (like advanced analytics, similarity search, model-based patient-specific simulation and prediction, etc.), while basic features of the platform can be accessed for free." (22)* *1) "The base offer is free for the user and additional services would be charged (encrypted backups, more disc space, more instances, more apps simultaneously installed, a domain name ....)" (15)* *1) "The app is distributed on a freemium basis with all basic features free and premium features charged (from individuals) at $7 per year."(4)* *2) "PIMS could be included inside another service that customer are already paying for (such as an Internet/Mobile subscription)" (20)* *3) "We will ultimately charge consumers a fee, corresponding to a fraction of the savings realized by the consumers from using our service to help them manage their data to obtain better deals." (11)*	- Individual - Service provider	• enhancements for free • fees from facilitating data exchanges • fees from micro-transactions • financial incentives for customers • financing by commercial organisations • free • free for individuals • freemium model • fees from app/service developers • fees from partners • funds from users • grant access to customers • hybrid models • individual pays • revenue from integration for business partners • intention based engagement • licensing arrangements • maintenance fee • micro-payments per transaction • not only single model • one-time fee for membership and registration • one-time purchase • organisation pays • organisations should pay the most

Appendix 2: Revenue models, propositions behind them and citations from the data.

Revenue models (Themes)	Short explanation	Example (company code after the citation)	Revenue source	Codes used in the analysis
Connection fee	1) Connection fee for an organisation offering services on the platform 2) Connection fee for an organisation using personal data platform operator's data management outsourcing services	*1) "Organisations pay a one time connection fee per service to the (...) Platform and a onetime connection fee per individual they connect to using personal data services, consent management or identity services. They only pay for the individual once, regardless of the number of services the individual uses of the organisation connecting." (7)* *2) "Through use of the [company's] API layer, data generated by the partner's product and/or service will be stored in the user's (...) account. The partners (who require a trusted and independent partner to manage the personal health data generated by their products and/or services) pay [the company] a project fee to cover the cost to create the interface between [the company] and the partner's product and/or service. Once live, the partner will pay a maintenance fee based on number of users or quantity of data passed to the [company's] infrastructure." (1)*	- Service provider - Data source	• pay as you go • pay-for model • pay-per-use • per-dataflow basis • percentage of client's revenue • PIMS included into another service • platform access fee • premium model • primary financing by service providers • project fee • provision on data sales • push/pull • referencing an app on the platform • revenues back to society • scheme funded by industry
Membership fee	Organisations and individuals pay for the membership of the platform annually or as a one-time basis.	*Organisation pays: "The model is an annual membership that includes infrastructure support, trust mark licence, access to design tools and shared access to legal support on global compliance. The annual fees decrease with business size and will reduce as membership grows." (12)* *Organisation pays: "Organisation thereafter pays an annual support fee that represents 25% of the initial connection fee. They pay nothing for data volumes delivered or collected across the Platform." (7)* *Individual pays: "I believe it is justifiable to still charge individuals a basic fee for participating in such new services, however this should be constant and not depend on the amount of data they are willing to share. For example, in the XDI-based Respect Network architecture, individuals paid a one-time fee for membership and registration of an identifier (a "cloud name")." (16)* *Individual pays: "Users of the platform can elect to become members through the purchase of 1 membership share certificate at a price of CHF 100,-." (1)*	- Service provider - Data source -Individual	• service fee • fees from services to users • smart contracts • sponsorship • subscription • financial model towards user engagement • transaction fee • transparent tariff table • trust necessary • war of ad blockers

Appendix 2: Revenue models, propositions behind them and citations from the data.

Revenue models (Themes)	Short explanation	Example (company code after the citation)	Revenue source	Codes used in the analysis
Propositions behind the revenue models				
No advertising model	The respondents agree that a revenue model should be based on other models than advertising.	*"Ad-financed platforms: the model to avoid if it does not comprise the appropriate privacy framework." (10)* *"The rising cost of ad tech and the control held by a small number of data collecting entities (Google, Facebook) is now recognised as a market that is challenged and becoming increasingly ineffective. Combine this with the growing sentiment of individuals to block digital advertising and seek more personal experiences and connections with trusted brands and there is an increasing opportunity for new business models to emerge." (23)* *"We believe that awareness is growing of the true cost of freemium-type services which are provided free by organisations in return for rights to analyse the individual's behaviour or serve up advertising or simply monetise the value of their data. Whilst they will remain at scale for some time along with the closed ecosystems or 'walled gardens' of large organisations working this way, they will ultimately decline as distrust and significant risks are exposed." (7)*	-	
Free for individuals	Individuals pay nothing for the services on the platform.	*"We believe that the service to store, manage and share health data should be free to the users." (1)* *"Consumers expect services to be free and we don't see that that needs to change." (25)* *"The challenge is to create sufficient scale by offering to consumers, free of charge, one or more appealing apps that make use of the [organisation's] Scheme." (6)* *"This postal fee is the strategic business model and when introduced will result in the app being 100% free to users."(4)* *"Individuals are the community we serve as a community interest company. We provide all services, tools and utilities to them free of charge." (7)* *"(...) at least part of the service will be completely free, not sure if we will need to introduce premium services, to ensure sustainability." (10)*		

Appendix 2: Revenue models, propositions behind them and citations from the data.

In the data analysis, we follow abductive reasoning (Tavory and Timmermans, 2014), thus in the analysis process, we go back-and-forth between the conceptual framework and own observations from the data. The coding and analysis was conducted following thematic analysis (see Braun and Clarke, 2006; Guest, 2012). First, two authors of this paper familiarised themselves with the data, thus went through all the questionnaire answers several times. Second, the researchers started labelling and sorting the data and as a result, the researchers identified and created 67 codes that were used in the final analysis. (See Appendix 2). The third step was to further analyse the codes and identify 6 higher order themes that create more understanding of the value capturing of personal data platform operators. Following the data analysis process, we identified the following themes: a transaction fee, service fee, connection fee, membership fee, no-advertising model and free for individuals. In the next chapters, we will further discuss about the results of data analysis and the contribution to literature.

Results

Revenue models of personal data platform operators

Based on the qualitative thematic analysis of 27 organizations from 12 different countries, we identified three main stakeholders that are needed in order a personal data platform operator to capture value, namely 1) an individual using the platform service and giving consent to share personal data, 2) a data source that collects and stores data about the individual and 3) a data using organisation or in other words a service provider. Companies can have both the role of a data source and a service provider.

In the context of human-centered personal data management, personal data platform operators are firms that enable the facilitation of personal data among data sources and data using organizations with the consent and for the benefit of an individual. On a personal data platform, an individual can access to, use and share their personal data such as health, wellness, financial and social media data. Two of the personal data platform operators focus on the facilitation of health and medical data, whereas the other personal data platform operators have ambitions in enabling larger variety of data integration and use via the platform.

In our study, we found out that personal data platform operators may generate revenue from individuals, data sources and service providers by charging one or multiple fees. Even if a primary source of revenue can be found, there usually is more than one fee. Revenue is mainly generated from service providers that request for personal data from individuals on the platform, as shown in Figure 1 below. As an example, a healthcare

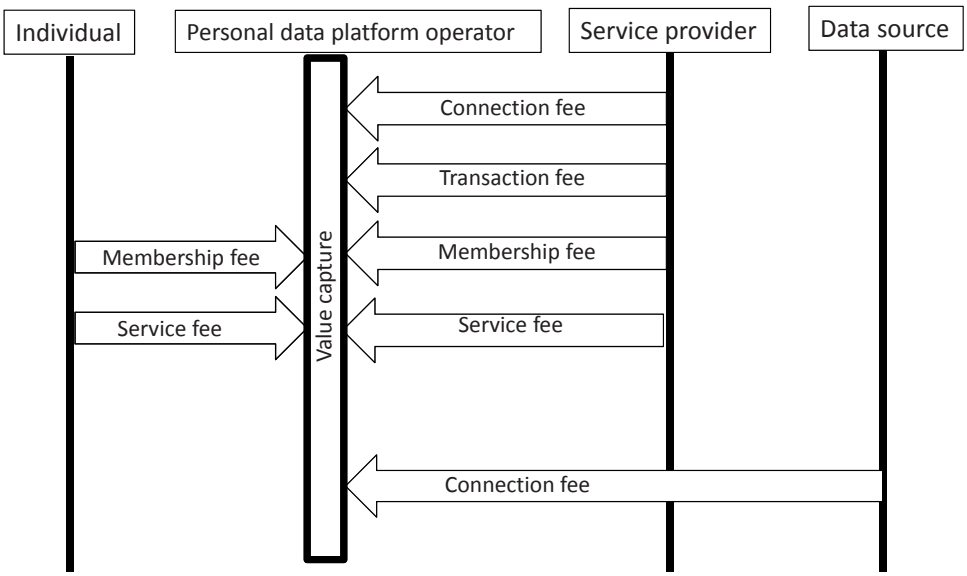

Figure 1: Revenue models and the key stakeholders of a personal data platform operator.

provider may want to have access to data from another clinic to provide the best service for the individual. In this case, data can be accessed via the platform by asking consent from the individual, and then with the consent, pulling a copy of the data from the data source for the use of the healthcare provider. In some cases, revenue can be generated from individuals and the data sources as well. In our analysis of personal data platform's revenue models, we found that the revenue models consist of four different fees that together illustrate the revenue model of a personal data platform operator, thus how the company captures value. The fees are a service fee, connection fee, membership fee and transaction fee. The results of our data analysis propose that value capture is about either adopting one fee or using the combination of fees from various sources, combining fixed and pay-per-use models and therefore generating recurring and stable revenue. To create more understanding of the revenue models of personal data platform, we will next discuss about the different fees more profoundly.

The fees can be divided into two categories, namely a *transaction-based model* that consists of a transaction fee and a *service-based model* that consists of a service fee, connection fee and membership fee. In a transaction-based model a personal data platform operator generates revenue by facilitating data transactions between the stakeholders. In a service-based model the personal data platform operator generates revenue by offering value-adding services on the platform or charging for the usage of the platform. The following Table 2 illustrates how personal data platform operators can capture value in the context of human-centered personal data management.

Service fee is the most agreed on revenue model and it may take different forms. Service fees are generated both from service providers and in some cases from individuals. The most popular model is freemium, which means that the personal data platform operator provides the basic platform service for free and any extra services or enhancements provided by

Revenue model	Description	Quotation example
Service fee (Service-based)	Service providers and individuals pay for value-adding services on the platform.	"The app is distributed on a freemium basis with all basic features free and premium features charged (from individuals)..." (4)
Membership fee (Service based)	Service providers and individuals pay for the membership of the platform either annually or one-time basis.	"The model is an annual membership that includes infrastructure support, trust mark licence, access to design tools and shared access to legal support on global compliance. The annual fees decrease with business size and will reduce as membership grows." (12)
Transaction fee (Transaction-based)	Service providers pay for the data transaction from a data source.	"The costs of operating the platform need to be covered by fees from partners needing a compliant and user accepted health data storage solution; fees from facilitating data exchanges" (1)
Connection fee (Service-based)	Service providers pay for connecting their services to the platform and connecting with individuals on the platform. Data sources pay for the creation of application interfaces when outsourcing personal data management to personal data platform operator.	"Organisations pay a one time connection fee per service to the (...) Platform and a onetime connection fee per individual they connect to using personal data services, consent management or identity services. They only pay for the individual once, regardless of the number of services the individual uses of the organisation connecting." (7)

Table 2: Revenue models of personal data platform operators.

the platform operator or a third party on the platform would be charged from the individual or the service provider. Another model is to charge individuals with a fee based on the possible savings realised by the individual. We think that this is a model resulted from the transparency of the concept of enabling individuals to control their own personal data. The model is based on an idea that when individuals have transparency on how their data is used and they will get value in return, they would be willing to give a fraction of the perceived value or benefit to the personal data platform operator that made the transaction happen. This would benefit all sides of the platform and therefore increase the use of data in the market. For example, if an individual uses the platform to negotiate better deals with service providers based on personal data or if the individual gets personalised services based on the personal data shared via the platform, personal data platform operator would charge the individual with a fee. The cost of operating the platform could also be covered by including a fee into the existing services that individuals are already paying for. This could be the case if a company from other field like a bank or a telecom operator would start offering a personal platform for their existing customers.

Some of the respondents charge organisations and individuals for *the membership* of the platform either annually or as one-time basis. For a service provider, the membership fee can be a fixed sum or, for example, based on the size of the organisation or on the number of individuals using the services on the platform. For individuals, membership fee was fixed on every platform studied. After paying the membership fee, individuals can share as much data as they want and use any of the services for free. Based on our findings, a membership fee is mostly used by cooperatives and non-profit personal data platform operators.

Platform operators may generate revenue on transaction-based by taking fees for facilitating data transactions between an individual and the service provider if the individual agrees to share his or her personal data with the organisation in return of value. *A transaction fee* is always charged from the organisation asking for data, not from the individual. Instead, individuals may even be rewarded for sharing their data. Furthermore, our research shows that most of the respondents that have a transaction-based model are commercial companies. Alternative model adopted by one of the respondents is revenue sharing, thus the personal data platform operator offers organisations with free data transactions and charge them only when a service provider either pays an individual for the access to data or charges an individual a fee for its own service on the platform. In these cases, the personal data platform operator will charge the organisation a transaction fee of few percent of the value of the transaction.

Connection fee model was introduced by two personal data platform operators. *Connection fees* are generated 1) from service providers that offer their services to individuals on the platform, thus connect with the individuals and 2) from data sources that need to connect to the platform to use data management outsourcing services provided by the platform operator. A personal data platform operator can charge a service provider a one-time connection fee for each service it offers and individuals that they connect with on the platform (number of the individuals using the platform). In the case of a data source, a personal data platform operator may charge for the creation of an application programming interface layer between the platform and the data source and thereafter charge for the data transferred from the data source to the individuals' accounts on the platform. Data sources do not offer their services on the operator's platform but instead may want to outsource their personal data management to a trusted party, so that the data generated by the data source (sometimes as a side product) is managed properly according to the regulations, in a secure and human-centered and individuals are provided with a way to see, access and share their personal data, thus benefit from it.

Propositions behind the revenue models of personal data platform operators

During the data analysis, we identified two propositions as the foundation of creating revenue models for personal data platform operators, namely "no-advertising" and "free for users" models. The "no-advertising" proposition means that none of the personal data platform operators use advertising as a source of revenue. In addition, three of the respondents explicitly stressed that they do not have an advertising-based model. The respondents agree that when applying

human-centered approach to personal data management, a revenue model cannot be based on monetizing individuals' data and selling it to advertiser, but other models must be developed to enable transparency for the individuals on how their data is used and increased value. The data analysis shows that a no-advertising model stands as the foundation and ideology for other revenue models to be built on and can be part of the platform value proposition for individuals.

Also, total of six respondents think that a platform service to store, manage and share personal data should be free for individuals. These personal data platform operators offer individuals with a free service and cover the costs of operating the platform by charging the organisations using the data, thus service providers. In this case, individuals do not pay anything for the services on the platform or for sharing data with companies or organisations. It seems that this model is suitable especially for personal data platform operators that have many individuals on their platform that share personal data. For example, one of the respondents shared that it is going to change its business model from a current membership-based model to 'free for individuals' as soon as they are technically able to provide individuals with a way to share their data with companies and research organisations. In this case, after the service becomes free for individuals, the personal data platform operator will generate revenue mainly from organisations paying for getting personal data via the platform with the consent of the individual. At the time answering to the questionnaire, this specific personal data operator generated revenue from premium individual customers that are paying for enhancements like personal data store on the platform. Therefore, it seems that before the "free for individuals" model can be fully introduced, stable revenue sources from other stakeholders are needed. The lack of advertisement revenues and the need for money for getting the business up and running before the data sharing capability are reasons for introducing membership fees and service fees for individuals at the early stage of the platform service.

Discussion and conclusion

Research related to business model innovation has been conducted in many fields including innovation management, strategic management and entrepreneurship literature. In many cases, technology has been seen as an enabler for new business model innovation. (Baden-Fuller and Haefliger, 2013.) Our research investigated the personal data management point of the technology design and business model innovation emphasizing the optional revenue models that emerge due to the new type of personal data usage.

Implications to research

Digital technologies are changing the current business models and facilitate new business models that either have not existed before or are new in a specific firm or sector. With the support of the digital technologies, a firm can enhance existing activities, support new ways of conducting business or transform the way business is done (Li, 2017). These trends and opportunities have not yet been fully understood and further research is needed (Spieth et al. 2014). One of the significant trends in business model innovation is multi-sided market (Li 2017), in which digital transactions can take place (Doligalski, 2018), that has enabled the emergence of new services and revenue models (Pagani, 2013) and that brings together two or more stakeholders (Muzellec et al. 2015), to co-create value (Breidbach and Brodie, 2017). When opportunities for value creation exists in the market, it is critical to understand how a firm can develop its business model to improve its capability to capture the value (Spieth et al. 2014, pp. 244). In prior research, platform revenue models have been studied in the context of e-marketplace (Brunn et al., 2002) and social networks (Enders et al., 2008; Wang et al., 2014), as examples. However, many of the prevalent platform business models have been based on collecting and selling individual's personal data (c.f. Weber, 2015; Muzellec et al., 2015). Due to the data privacy regulations (c.f. European Commission, 2016) and increasing awareness about data privacy among individuals (Vescovi et al., 2015, Spiekermann and Novotny, 2015), there is a need for a human-centered approach in the use of personal data in business, and allowing individuals to be in control over the use and access of their personal data, such as health, social and financial data. (c.f. Gnesi et al., 2014; Vescovi et al., 2015). By studying 27 organizations in 12 countries, this qualitative research contributes to our understanding on platform business models in the context of human-centered personal data management.

The contributions of this study are three-fold. First, we identify revenue models for personal data platform operators in the context of human-centered personal data management and discuss the relation to prior research. Second, based on the findings, we argue that advertising as a fee is explicitly avoided by the personal data platform operators in this context, although in previous studies. advertising has been considered as a key part of a revenue model in other multi-sided markets (c.f. Lumpkin and Dess, 2004; Wirtz et al., 2010). We argue that following a no-advertising proposition creates a need for a personal data platform operator to use other sources of revenue. In practice, our study shows that personal data platform operators capture value mainly from the service providers side and charging service- and transaction-based fees. Third, rising from the analysis, a new fee in the context of human-centered personal data management is suggested, namely a connection fee. Next, we will discuss more about the three key findings and the contribution to platform business model research.

First, based on our findings, in the context of human-centered personal data management, a personal data platform operator's revenue model can either be one fee or be a combination of fees. *The revenue models of a personal data platform operator* are the service fee, membership fee, transaction fee and connection fee. In the context of human-centered personal data management, individuals are in control of the use, access and share of their personal data, and they can allow a data requesting organisation to use their data for the specific, defined and value creating purpose. We argue that the choices of personal data platform operators concerning their revenue model in this context tells about the aim for creating more transparent, human-centered and privacy-preserving business model in personal data business. Charging for a service, membership, transaction and connection can be seen as an effort of personal data platform operators to bring greater deal of transparency and privacy over how revenue is generated in platform business, comparing to many prevalent business models where the platform service is provided for free and in return the personal data is collected and monetised with advertising. (Tucker, 2014). In the context of human-centered personal data management, a personal data platform operator charges service providers for the data transactions and charges for service providers, data sources or individuals for the usage of the platform by offering value-adding services. However, according to our analysis, many of the studied platform operators choose to offer the platform as free for individuals. In line with prior studies on platform business models (c.f. Wang et al., 2014), the individuals' side is subsidized and revenue is generated from the other sides of the platform. In line with Täuscher and Laudien's (2017) study in the context of start-up marketplace platforms, platform providers generate fees mainly from the service providers (or sellers) whereas individuals (or buyers) use the platform mostly for free. Our findings indicate that business models for personal data platform operators in the context of human-centered personal data management are based on enabling individuals to manage their personal data and enabling service providers to access the data, and finally capture the value with different service- and transaction-based fees. This model differs from current platform business models that are usually based on using the platform as a channel for service providers to sell and advertise their services (see Wang et al., 2014; Weber, 2015). These findings contribute to our understanding about the suitable business models in the digital era from revenue model perspective, thus how platform operators can capture value with revenue models while also considering individuals' rights over their personal data and data privacy. Personal data platform operator revenue model has also similarities with traditional platform revenue models. For example, similarly than Apple iTunes, Uber and AirBnB platforms generate revenue per tune played, per ride and per rental (Iivari et al., 2016), a personal data platform operator can take a share per data transaction made via the platform.

Second, we show that *advertising is not used and seems to be explicitly avoided among the personal data platform operators*. This is surprising and can be seen as a contextual finding, because the literature review made in this study showed that advertisement is considered as one of the most used revenue models in multi-sided markets. (See table 1). Our finding supports Enders (2008) who identified a model of "no advertising" in the context of social networking sites and is adopted by only handful of companies today. We think that the "no advertising model" already reflects the changing attitudes towards personal data usage, individuals' rights

to privacy and companies' need in finding alternative revenue models. Enders found that one of the most well-known social networking platforms in Europe that enables users to connect and share personal content has taken a no-advertising policy and charges users relatively high prices for the service (Enders et al., 2008), covering the cost of having no advertisements on the platform, giving individuals more privacy and control. Our research shows that when adopting human-centered approach to personal data management, no-advertising policy serves as the foundation of a revenue model and is applied by all the personal data platform operators studied. However, differing from Enders's findings, the costs are covered mainly by charging service providers and data using organisations, not the individuals. One reason for advertising being avoided in the emerging platform businesses could be the attempt to stand out as "human-centered" alternatives for the current platforms that have traditionally collected and sold individuals' personal data and their attention to advertisers without individuals' explicit consent. Advertisers have been willing to pay for the individuals who see their advertisements and even more if they know who is watching (Sabourin, 2016). Although advertising-as-usual seems to be unsuitable revenue model in this context, a platform could probably be a place where individuals could share their intentions and data to service providers by giving their consent on the platform. Based on the intention and need, these service providers could offer the individuals with discounts and personalised advertisements. This model would not only create value for individuals and increase revenue for service providers as increased sales but would enable personal data platform operators to create revenue streams from increased data transactions and increased use of the platform. In line with Rayna et al. (2015), we believe that offering individuals with personalised data-using services instead of only showing them advertisements on the platform has a chance to result with even more revenues in the long run. The services can be provided by the personal data platform provider itself or a service provider, in which case the platform provider can charge transaction and connection fees. Therefore, we argue that one of the implications of adopting a non-advertising model from platform business model perspective can be the creation of new data-based services that create value for individuals and for which the individuals are willing to pay for to cover the costs of platform business model. Also, exclusion of advertising from the revenue model is one way for digital platform operators to differentiate themselves in the market. Even though advertisements can provide revenue streams for the platform, they can also be perceived as nuisance by the individuals and therefore can result in fewer users on the platform (Ghose and Han, 2014). From this perspective, we think that being an advertisement-fee platform is not only about having an ideology of human-centered data management behind the business, but the choice of revenue models probably is part of a larger marketing and positioning strategy and value proposition of platform operators. In fact, positioning with a slightly different revenue model is one way to gain competitive advantage in the digital market, because the greater the level of competition with the same business model, the lower the changes for the firm to create value. (Zott and Amit 2007) In the gaming industry, it has already been shown that advertisement-free games generate more revenue than freemium games with advertisements. Platforms with advertisements will need to create more value than the emerging add-free premium services in order to stay competitive and retain users in the future. (Rietveld 2017) Our findings support Täuscher and Laudien's (2017) who found that in the sample of 100 digital platform start-ups, advertising was used as revenue model only in two percent of them. Supporting our findings, they found that the most popular revenue models are taking a fix cut or a cut measured in percentage from a transaction and subscription. Our findings, in line with Täuscher and Laudien's (2017), show that there is a clear shift towards advertisement-free platforms whose main goal is to enable increased value opportunities for individuals and service providers who are willing to pay for the benefits of the platform.

Third, in this study, a new revenue model in the context of human-centered personal data management was identified, namely *a connection fee* that has not been recognised in previous studies on multi-sided markets. (see Table 3). Many times, new business models are not entirely new in the unprecedented sense, but they can be regarded as new for a firm or in the market or sector. (Li, 2017). The idea of a connection fee itself is not new. As an example, in the field of telecommunication (Gordijn & Akkermans 2003; Riquelme 2001)

connection fees or bigger fees upfront are used as part of their revenue model. With the best knowledge of the authors, a connection fee is a new revenue model that has not been identified in prior research of multi-sided markets. The emergence of a connection fee in this context may be because sharing of data requires a secure and functional data framework. Building such a framework is a great investment and it cannot realistically be the responsibility of a single company. Before a personal data platform operator can charge for data transactions, membership or services, it must create a framework for stakeholders to share, store and manage personal data in a beneficial way. According to Gomes and Moqaddemerad (2016), one of the greatest challenges companies face when planning to expand their business is the firm's and the market's readiness regarding to network and connectivity standards. A connection fee introduced by two of the respondents could support the creation of a data sharing infrastructure, thus interfaces between services and databases, for the mutual benefit of stakeholders and new business opportunities.

Besides to the suitable revenue models, we found that to capture value in the context of individuals being in control of their personal data, personal data platform operators should enable stakeholders to integrate and share personal data and derive value from it. In fact, our research findings show that there is a clear need for not only business models for personal data platform operators but for every stakeholder to find mutually beneficial ways for sharing of data, using it and creating new business. In line with Redman (2015), we see that access to data will change the strategies of every company. Some of the personal data platform operators even showed interest in adopting an open business model, meaning that they would share the revenue generated from data transactions with the stakeholders in the ecosystem as an attempt to build a sustainable market of data sharing actors. Our finding about personal data platform operators' effort of finding suitable revenue models for all, not only for themselves, is in line with Vargo and Akaka (2012), who note that to be successful one needs to continuously be looking for new ways to create value for itself and others. Accordingly, the critical factor of successful data integration and usage is the ability of an actor to survive and thrive in its context (Vargo et al., 2008), thus its ability to capture value by first enabling value (co)creation for all sides of the platform.

Implications to practice

We think that capturing of value is one of the main challenges that a platform operator faces when creating a business model, because there is no "one size fits all" model for revenue models (Sabourin, 2016).

Revenue models of personal data platform operators	Revenue models found in the literature
Service fee	Freemium model (Wang et al., 2014) Free plus premium membership (Enders et al., 2008)
Membership fee	Subscription model (Enders et al., 2008) Subscription (Wirtz et al., 2010)
Transaction fee	Transaction model (Enders et al., 2008) Transaction market (Filistrucchi et al., 2014) Transaction-based model (Wang et al., 2014)
Connection fee	N/A
Propositions behind personal data platform operator's revenue models	**Propositions found in the literature**
Free for individuals	Free for users (Muzellec et al., 2015) Service for free (Enders et al., 2008)
No advertising	No-advertising policy (Enders et al., 2008)

Table 3: Comparison of personal data platform operator's revenue models to revenue models in other multi-sided markets.

Moreover, revenue models should be combined and tailored for the specific company and context (Lumpkin and Dess, 2004). This study is useful for companies that are interested in developing new data-based services and business models that take human-centered approach to personal data management. However, the findings of this study have not been tested and therefore should be taken as suggestions.

This study increases understanding about suitable revenue models for personal data platform operators. We also present propositions (no advertisements and free for individuals) that can be considered as the foundation of revenue model creation in this context. Brownlow et al. (2015) argue that incorporating a data driven business model is critical for the success of a company. It was shown in our study that current personal data platform operators see several optional revenue models being deployed. We also described similarities and differences in revenue models of current operating platform operators and the emerging personal data platform operators. The comparison gives a clear idea of how adopting human-centered approach to personal data management can affect into how revenue is generated.

In this study, in addition to creating new knowledge about revenue models for personal data platforms, it was realized that there is a movement from reactive healthcare focused model to proactive wellness-oriented model and it is supported by personal data platform operators. In wellness-oriented model the focus is on motivating and giving people the tools to take better care of their own health and to decrease the overall costs of our healthcare system. Personal data platform operators that provide easy access to data on exercise, diet and ambient environment along with intelligent processing and presentation of the data, are important in supporting sustainable behaviour change. The most successful services should place the sensing and supporting technologies around the real needs of individuals in a manner that is highly personalized and supportive and evolves along with the individual and their needs. (McGrath and Scanaill, 2013.)

Limitations and future work

The limitations of this paper are discussed in this chapter. The first limitation of this study is due to the lack of prior research on platform business models in the context of human-centered personal data management. The literature review was conducted by studying revenue models on a higher level, by looking at business models found suitable in other multi-sided markets. As a result, the revenue models found in the literature review provided us a good idea of how value is captured in multi-sided markets but could not be directly generalizable in the context of human-centered personal data management. This is mainly because many of the revenue models were based on organisation-centered approach, which takes a view of a platform owning its users (Wang et al., 2014) as part of a value proposition and as a commodity that can be monetized (Muzellec et al., 2015).

Second limitation is due to the data collection. The respondents gave long and diligent answers concerning revenue models. However, since the questionnaire was sent by the European Commission, the respondents answered not only to provide information for research but also to influence on Commission's actions and support in this market. Also, the respondents were informed about the publicity of the answers and therefore no business secrets were shared. Therefore, it is possible that the respondents did not reveal all details of their revenue models because of the chosen data collection method or the sender.

Third, this study focused only on revenue models of all the identified business model "building blocks" (c.f. Osterwalder and Pigneur, 2010). We focused on identifying revenue models based on the data from 27 organisations. Focusing on only revenue models is appropriate when studying emerging business, because there is a risk to get confused with the processes of value creation and value capture. Although a firm can create value it may or may not be able to capture it in the long run. As an example, some of the value created by a personal data platform operator by enabling stakeholders to share and benefit from personal data may spread to the society as a whole, or alternatively the company may not be able to capture all the value created because of the lack of suitable revenue models. (Lepak et al., 2007.) Nevertheless, the definition of a revenue model as a description of the ways of gaining monetary benefits in exchange of value indicates that a company or other actors in the multi-sided market must create value to the personal data platform operator to capture it. Therefore, research is needed about how different

stakeholders perceive value, how personal data platform operators enable value (co)creation among stakeholders or propose value with value proposition.

Fourth, the market of personal data and business models are constantly developing. Furthermore, the human-centered approach to personal data management is relatively new, and the studied personal data platform operators are in a phase of developing their business models. Therefore, generalisation of this research is challenging if not possible based on one qualitative study and is not even the purpose of this study. This research provides a snapshot of the emerging revenue models and is one of the first attempts to gain more understanding about how personal data platform operators can capture value when data is being in control of the individuals. Further qualitative and quantitative research is needed from both from value creation and value capture perspectives. We would especially like to see case studies that go deep into one or two cases and increase knowledge about business models and the benefits of personal data usage in the context of human-centered personal data management. Further research could assess what is the role of context and maturity phase of platform operators in revenue model generation, as we found that our findings on platform revenue models have similarities to the ones of previous studies of platform operator start-ups in different context (c.f. Täuscher and Laudien 2017).

The Fifth limitation of this study lays on the external validity since the study is based on randomly selected sample population of 27 organizations only. As qualitative research typically (Johnson 1997), the target of this research, however, is rather to document the key findings related to the revenue models of platform operators in the context of human-centered personal data management than to generalize the results across populations. Lastly, deeper understanding of this phenomenon could be achieved by collecting more comprehensive data from personal data platform operators in longitudinal manner as the phenomenon of human-centred personal data management and the data platform business models mature.

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About the Authors

M.Sc. Laura Kemppainen is a doctoral candidate at Martti Ahtisaari Institute of Global Business and Economics at the AACSB accredited Oulu Business School, Finland. She holds a M.Sc. in Marketing from Oulu Business School. Laura's research interests include platform business models, human-centered personal data management, digital innovation and value creation. The objective of the doctoral dissertation is to build more profound understanding about the creation, capture and co-creation of value in the emerging platform-driven and human-centered personal data ecosystem through the lens of service-dominant logic of marketing.

Dr. Timo Koivumäki is a professor of digital service business at Martti Ahtisaari Institute, University of Oulu Business School. Previously he has worked as a research professor of mobile business applications at VTT and at University of Oulu, as a professor of information and communication business and as a research professor of electronic commerce at the University of Oulu. All in all, Koivumäki has over 20 years of experience in the field of digital business. His research interests include consumer behavior in digital environments, user-driven innovation, digital service business, digital marketing and strategic networking. Koivumäki has been active in various duties (e.g. planning, managing and conducting research) in many national and international research and development projects. Koivumäki has also published in numerous top level academic journals.

About the Authors

Minna Pikkarainen is a joint professor of Connected Health in VTT Technical Research Centre of Finland and University of Oulu / Oulu Business School, Martti Ahtisaari Institute and Faculty of Medicine. The research professor is working as a scientific leader and as a collaborator between different units and departments in University of Oulu, VTT and other OuluHealth (http://www.ouluhealth.fi/) ecosystem players from both public and private sector. Currently Minna is focusing on her research in the data, AI driven service co-creation and decision making services in health and wellbeing sectors. In her current projects Minna has been researching the health transformation, innovation orchestration and ecosystemic business models. During 2010-2012 Minna Pikkarainen has been working as a business developer in Institute Mines Telecom, Paris and EIT (European Innovation Technology) network in Helsinki. Her key focus areas as a business developer has been in healthcare organizations and digital cities. Before Minna's research has been focused on the areas of software development, agile development and service innovation.

Antti Poikola is a PhD researcher at Aalto University / Department of Computer Science with research interests in how to utilize personal data for the benefit of individuals. He is the main author for the guidebook, MyData - human centric way to organize personal data recently published by the Finnish Ministry of Transport and Communications. Poikola is also experienced community builder, he has been successfully facilitating the establishment of Finnish ecosystem around open data, Finnish industry alliance for MyData and European network of personal data management platform providers.

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Extending the Business-to-Business (B2B) Model Towards a Business-to-Consumer (B2C) Model for Telemonitoring Patients with Chronic Heart Failure (CHF)

Andrija S. Grustam [1], Hubertus J.M. Vrijhoef [2], Ron Koymans [3], Vasilis Poulikidis [4], and Johan L. Severens [5]

Abstract

Purpose: The purpose of this paper is to describe an alternative approach to telemonitoring patients suffering from Chronic Heart Failure (CHF), i.e. the Business-to-Consumer model (B2C), by extending the current Business-to-Business model (B2B). The B2C model is the one where the customer, in this case the patient, is the payer for the services consumed. We describe and perform an initial evaluation of the extension of the B2B to the B2C model for telemonitoring patients with CHF.

Design/Methodology/Approach: We explored the problems in implementation of telemonitoring via the B2B model by means of a Root Cause Analysis, including the *5-whys* method to help us understand the shortcomings of the B2B approach, and then the *5W1H* method to explore whether the B2C is a better strategy. The extension of the model was executed in the Business Model Generation framework. By using qualitative content analysis techniques we supported our argumentation with findings from other studies.

Findings: The B2C model is based on the interplay of four agents – Healthcare Provider, Equipment Manufacturer, Payer/Regulator and Distributor/Promotor – all working together to improve health related outcomes in a jurisdiction. The success of the extended model in telemonitoring CHF hinges on Telemonitoring Center and Telehealth Nurses being repositioned in the out-of-the hospital setting.

Social implications: We believe that penetration of mobile telehealth via the B2C model will allow for greater availability, access and equity in healthcare for patients with CHF.

Originality/Value: We introduced a fourth pillar to the existing B2B model, i.e. Distributors and/or Promotors. The B2C model we propose does not exist currently but might allow for scalability, generalizability and transferability of telemonitoring currently unattained with the B2B model.

Keywords: Telemonitoring; Chronic Heart Failure; Business Model; B2B; B2C;

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1 Erasmus School of Health Policy and Management, Erasmus University Rotterdam; Professional Healthcare Services & Solutions, Philips Research, grustam@eshpm.eur.nl

2 Department of Patient & Care, Maastricht UMC, The Netherlands; Department of Family Medicine and Chronic Care, Vrije Universiteit Brussels, Belgium; Panaxea b.v., Amsterdam, the Netherlands, b.vrijhoef@mumc.nl

3 Professional Healthcare Services & Solutions, Philips Research, ron.koymans@philips.com

4 Rotterdam School of Management, Erasmus University Rotterdam, v.poulikidis@gmail.com

5 Erasmus School of Health Policy and Management, Erasmus University Rotterdam; iMTA, Institute of Medical Technology Assessment, Erasmus University Rotterdam, severens@eshpm.eur.nl

Introduction

Population aging is no longer a rich-country phenomenon. In high-income, as well as in middle and low-income countries the populations are getting older, the healthcare workforce is becoming scarce and the cost of care is accounting for an increasing proportion of the Gross Domestic Product (Bodenheimer, 2005; Lee *et al.*, 2010). At the same time, healthcare delivery is fragmented, uncoordinated and not value-based (Porter, 2009; Gomes and Moqaddamerad, 2016).

The greatest burden of disease globally is attributed to chronic diseases, which are expected to continue to contribute the most disability-adjusted life-years (DALYs) through 2020 (Krum *et al.*, 2005). Mathers and Loncar (2006) further investigated the global burden of disease in the years 2020-2030 and found that there will be no change in rank from the first Global Burden of Disease study (Murray and Lopez, 1997), with ischemic heart disease topping the list of the leading causes of death in high-, middle- and low-income countries (15.8%, 14.4% and 13.4% of total deaths, respectively). Ischemic heart disease is "the principal etiology of heart failure in the Western world" (Remme, 2000).

Many patients suffering from chronic diseases are not sufficiently empowered to manage their own disease, they rarely have means to track the disease progression and their understanding of the disease is vague (Krumholz *et al.*, 2002). Moreover, the majority of chronic patients are suffering from multimorbidity, i.e. two or more chronic diseases (Barnett *et al.*, 2012; Oostrom *et al.*, 2014; Ornstein *et al.*, 2013).

Telemonitoring has the potential to support timely detection and slower disease progression in chronic heart failure (Chaudhry *et al.*, 2007). Inglis (2010) defined telemonitoring as "the transmission of physiologic data, such as an electrocardiogram (ECG), blood pressure, weight, respiratory rate, and other information, such as self-care, education, lifestyle modification and medicine administration, using... technology like broadband, satellite, wireless or Bluetooth".

Today, telemonitoring is mostly implemented via a Business-to-Business model (B2B), usually involving cooperation between a healthcare organization and an equipment manufacturer (Herzlinger *et al.*, 2014). A business model describes "the rationale of how an organization creates, delivers and captures value" (Osterwalder and Pigneur, 2010). The B2B model in electronic communication has its advantages: 24/7 availability, breaking geographical barriers, selling in batches, organization-wide implementation and elimination of the 'middleman' (Botha *et al.*, 2008). However, the key challenges of the current model are well documented too: staffing, project management, provision of support, technology, partnerships, funding and strategy (Joseph *et al.*, 2011).

It has been difficult for telemonitoring introduced via a B2B model to become mainstream, as it seems not to flourish after the pilot testing phase (Willemse *et al.*, 2014). A broad deployment of patient-centric solutions is hampered by barriers, both external, like market forces, and internal, like the medical technology companies' impotencies (Erhard *et al.*, 2013). The successful model of implementation will have to satisfy the Triple Aim criteria: 1) improve the experience of care, 2) improve the health of patients, and 3) reduce costs (Berwick *et al.*, 2008).

Our analysis concerns patients with chronic heart failure (CHF) because of the severity of the disease and its universality. Based on the Framingham Heart Study, 30-day mortality for these patients is around 10%, 1-year mortality is 20-30%, and 5-year mortality is 45-60% (Levy *et al.*, 2002). In 1928 the New York Heart Association (NYHA) established a chronic heart failure classification that is now used worldwide (Dolgin, 1994), and has divided the patients into four groups according to the severity of the disease expressed in physical limitations and shortness of breath. As CHF is a highly lethal disease, patients need help and encouragement to adhere to the medical regime (Hanyu *et al.*, 1999; WHO, 2011).

Our objective is to describe a new model for the implementation of telemonitoring, i.e. the Business-to-Consumer model (B2C), by extending the current B2B model. B2C model in healthcare is enabled by digital technologies, and the advent of internet, where the customer (i.e. the patient) is the payer for the services consumed. We are keen on exploring whether extending the B2B model to B2C can "support citizens' and patients' health and well-being in the home and on the

move … and enable a virtual healthcare continuum" on an unprecedented scale (Schug, 2014), and if there is a difference to be expected in the speed and scale of implementation of telemonitoring for CHF patients via the extended business model.

Methods

Extending the Business-to-Business model (B2B) in telemonitoring of patients with chronic heart failure took three steps: 1) a Root Cause Analysis of problems in implementation of telemonitoring via B2B, 2) possible improvements via the B2C approach, and 3) the creation of the extended business model.

In the Root Cause Analysis section (Williams, 2001) we first applied the *5-whys* method in order to understand the shortcomings of the B2B model in telemonitoring of patients with chronic heart failure, and then the *5-whys-1-how* (5W1H) method for exploring whether the B2C might be a better strategy. The *5-whys* technique is used to explore the cause and effect relationship (Asian Development Bank, 2009) while the 5W1H technique is used to understand the context of the problem, and is called the Kipling Method because those six questions – *Who?, What?, Where?, When?, Why?* and *How?* – have been immortalized in a Rudyard Kipling poem published in "Just So Stories" in 1902 (Kipling, 2013). We selected and consulted scientific literature, brainstormed on these questions, and took a *devil's advocate* perspective to each of the five answers.

The model itself was crafted according to the Business Model Generation framework (Osterwalder and Pigneur, 2010; D'Souza, 2015). We employed this methodology as a proven one in various companies for generating innovative business models (Ahokangas and Myllykoski, 2014). It consists of nine building blocks: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure.

We supported our analysis with papers published in peer reviewed journals, covering multiple countries, and where possible in the form of reviews and meta-analyses. We searched for publications in English, since 2000, and in some exceptional cases from the 1990s. In addition, we used online resources of business literature from the same period (including ideas and concepts from various consultancies, companies, and magazines). As we are presenting a viewpoint article, we tried to support our argumentation with findings from other authors. We opted for a convenience sample (Given, 2008) of papers instead of a more systematic selection. Convenience sampling is a non-probability technique that uses sources because of their accessibility, which introduces bias. We looked for papers that support and oppose our perspective and included both, if found. We used qualitative content analysis techniques for systematization of ideas from other authors, in order to allow for categorization and quantification of presented concepts (Mayring, 2000). We worked with prior formulated, theoretically derived categories of *5-whys* and 5W1H methods, where the qualitative step of the analysis consisted of a methodically "controlled assignment of the category to a passage of text" (Mayring, 2000).

Results

Root Cause Analysis

Shortcomings of the B2B approach

Here we list the barriers of the B2B model to the implementation of telemonitoring. We start from the finding that the prevailing business model is not optimal for telemonitoring of CHF patients (Coye *et al.*, 2009) and investigate further the barriers reported in the literature.

The biggest trial in telehealth to date, the Whole System Demonstrator (WSD), which was carried out in three regions in the UK, lists the following barriers to participation and adoption of telemonitoring: "requirements for technical competence and operation of equipment; threats to identity, independence and self-care; expectations and experiences of disruption to services" (Sanders *et al.*, 2012). If the business model is based on the telemedicine service where equipment is being paid for, which was the case in the WSD, the problems obviously relate to technical and privacy issues.

Willemse *et al.* (2014) list the following three barriers for telemedicine in Belgium: 1) financial constraints, 2) incomplete transmural coordination, cooperation and digital communication and 3) telemonitoring not being integrated in routine care. On the financial constraint

side, the authors postulate lack of equipment (devices were not provided after the pilot phase) and no financial remuneration foreseen for the follow up of telemonitoring. In terms of coordination, cooperation and communication problems they list issues such as industrial partners offering different platforms for data storage; follow-up and coordination only performed in the own organization; no integration of telemonitoring data in patient records; transmural data sharing was not carried out; regular healthcare providers often did not participate. In terms of integration with routine care, telemonitoring was considered to require an additional effort in the pilot projects (Willemse *et al.*, 2014).

Coye *et al.* (2009) examined in greater depth the overview of barriers to the implementation of remote patient telemonitoring. On financial constraints they state that "financial models and assumptions needed to calculate costs and return on investment do not exist" (p. 129). Without detailed calculations of direct and indirect costs, be it healthcare or non-healthcare, no sustainable innovation can be successfully introduced. They continue: "perhaps most difficult of all – there are few models of implementation by individual physicians, large medical groups, or healthcare delivery systems to draw upon" (Coye *et al.*, 2009). Continuing to ask *why?* will eventually lead us to the "principal barriers" to innovation in chronic care: the (poor) effects of benefit design and reimbursement mechanisms (Baron and Cassel, 2008; Bodenheimer, 2008; Boult *et al.* ,1999).

Medicare/Medicaid, a US national social insurance, "reimburses for telehealth services when the originating site (where the patient is) is in a Health Professional Shortage Area (HPSA) or in a county that is outside of any Metropolitan Statistical Area (MSA), defined by HRSA and the Census Bureau, respectively" (HRSA, 2015). Medicare will reimburse for face-to-face interactions, store-and-forward applications (e.g. remote ECG application) but there is no single accepted reimbursement standard for private payers. The American Telemedicine Association conducted a national online survey of private payer reimbursement in 2012 and found "that private payers have administrative rules regarding telehealth reimbursement that are barriers to services and reimbursement, and that some providers would benefit from being better informed about billing and coding for telehealth services and how to advocate for telehealth services reimbursement" (Antoniotti *et al.*, 2014). In conclusion, Antoniotti *et al.* (2014) list the major reasons for not billing for services delivered via telemedicine: no Medicaid reimbursement (33%), major payers do not pay (32.4%), practice in urban area (19.3%), services are bundled through contracts (17.4%), could not get support from my organization (4.7%), too risky for penalties for fraud and abuse (4.7%), and other (43.9%).

Improvements via the B2C approach

Extending the B2B model towards the B2C model concerns the improvements in the following aspects: cost-effectiveness (i.e. health for money), modus and timing of introduction, education and self-management.

One of the impediments to wider uptake of telemonitoring is its business model (Acheampong and Vimarlund, 2014) while the other is its cost-effectiveness (Grustam *et al.*, 2014). The evidence that telemonitoring saves costs while improving outcomes is still debated in the literature (Blum and Gottlieb, 2014; Klersy *et al.*, 2011; Upatising *et al.*, 2015), while the optimal business model is yet to be found. Telemonitoring is currently introduced via the not easily scalable B2B approach, and literature does not examine other modalities of implementation or their cost-effectiveness (Acheampong and Vimarlund, 2014; Dijkstra *et al.*, 2006; Griffioen, 2012). Addressing the cost-effectiveness barriers as well as market and consumer barriers (regulations, ease of use, technology, access and coverage, promotion etc.) can lead to scalability.

Telemonitoring of chronic/multimorbid patients today is a time-bound activity. Patients usually stay with the B2B telemonitoring service anywhere from one to eighteen months (Maric *et al.*, 2009), whereas they could continue to use the B2C model for the duration of the disease (i.e. lifetime, as they are paying for the service themselves). An inability to properly manage CHF usually lands those patients in the emergency room (ER) and this significantly shortens their life prospects (Sanghavi *et al.*, 2014). Having access to the telemonitoring service at all times can be highly beneficial to CHF patients as telemonitoring has been shown to reduce mortality, hospital readmission and bed occupancy, even at short intervention and follow-up intervals (Louis *et al.*, 2003).

CHF patients should ideally be approached after an adverse health event (e.g. heart failure, mild infarct, stroke). That is a time when patients are most aware of their health problems and need to actively participate in the hospital discharge process (Hesselink *et al.*, 2014). Currently patients are recruited to clinical studies involving B2B telemedicine systems months after the onset of the disease. In the B2C model patients can be informed about the existence of the service at the point of departure from the healthcare system, or via public health channels (e.g. mass media campaigns). The B2C telemonitoring service should be available at all times to patients in a given jurisdiction.

Patient education is of importance to guarantee adherence. The self-management component of CHF programs (physical activity, drug adherence, diet, etc.) has "a positive effect, although not always significant, on reduction of numbers of all-cause hospital readmitted patients ... decrease in mortality and increasing quality of life" (Ditewig *et al.*, 2010). The educational component of the system allows for empowerment of patients, while the monitoring component helps with early detection of disease worsening. In most B2B cases the education is offered by a nurse – in person or via the telephone and rarely via the device (Maric *et al.*, 2009). This prevents patients from revisiting the message and impedes learning. In the B2C model education is always at hand, which should promote learning and behavioral change.

One of the main problems in telemonitoring is scalability (Zhang *et al.*, 2014), which comes with regulatory issues. The European Commission has indicated in the e-Commerce Directive that "for business-to-business (professional-to-professional) telemedicine services, such as teleradiology, the country of origin principle applies: the service offered by the professional must comply with the rules of the Member State of establishment. In the case of business-to-consumer activities (which might be relevant to telemonitoring services) the contractual obligations are exempted from the country of origin principle: the service might need to comply with the rules of the recipient's country" (Commission of the European Communities, 2008). This indicates that the telemonitoring provider should be based in the EU jurisdiction most favorable to eHealth and provide services to other member states via the internal market clause (Vollebregt, 2012). Using mass media to reach consumers, combined with referrals by physicians and pharmacists, might be a way to enroll patients in their thousands without establishing a physical presence in the jurisdiction (as is necessary with B2B today). Thus Business-to-Consumer (B2C) telemonitoring might pave the way to population-wide health monitoring either within or between countries.

The B2C telemonitoring service can be introduced initially as an increment of the B2B model. The B2B model is currently used by technology providers to implement their products in high-income countries. In the US, for example, after the adoption of the "meaningful use of IT in healthcare" initiative, Congress invested billions of dollars in infrastructure building to support three goals: improve quality of care, reduce costs, and increase access and coverage (Buntin *et al.*, 2010). Previous investments in B2B telemonitoring can help with the transition to B2C as systems have been deployed already, and the research findings are available too (Weinstein *et al.*, 2014). The rapid evolution of mobile health apps will be the promotor of B2C telemonitoring and will encourage patients to "accept greater responsibility for their own healthcare either individually or with their healthcare navigators" (Dorsey *et al.*, 2013; Weinstein *et al.*, 2014, p. 185).

Paré *et al.* (2007) found out that: "home telemonitoring of chronic diseases seems to be a promising patient management approach that produces accurate and reliable data, empowers patients, influences their attitudes and behaviors, and potentially improves their medical conditions" (p. 274). However, there is inconclusive evidence of the clinical effectiveness and cost-effectiveness of telemonitoring for CHF patients (Clark *et al.*, 2007; Grustam *et al.*, 2014; Wootton, 2012). While business model and cost-effectiveness are considered to be major barriers to further implementation of telemonitoring in chronic disease management, the enablers are to be found in duration of the intervention, modus and timing of introduction, education, and self-management (Table 1). Extending the B2B model towards B2C might be a way to tackle all those major deficiencies in the telemonitoring service today.

B2B Barriers	B2C Enablers
1) Technical - requirements for technical competence and operation of equipment, *2) Personal - threats to identity, independence and self-care,* *3) Organizational - incomplete transmural coordination, cooperation and digital communication, and* *4) Financial - poor effects of benefit design and reimbursement mechanisms.*	*1) Effectiveness – addressing regulations, ease of use, technology, access and coverage, promotion, etc. can lead to scalability,* *2) Modus and timing - the service is available at all times, for a lifetime,* *3) Education - always at hand, which should promote learning and behavioral change,* *4) Self-management - better health outcomes.*

Table 1: Summary table of the barriers and enablers in CHF telemonitoring

Business Model Generation

Next, we describe in detail the Business-to-Consumer (B2C) model. We believe that its success hinges on two entities – the Telemonitoring center and Telehealth nurses – being repositioned in the out-of-the hospital setting. We depict the position of the two in the Business Model Canvas (Anon, 2014a). The canvas allows for improved clarity and understanding of this value proposition. Figure 1 presents the extended business model based on the findings generated by the 2 preceding steps - a Root Cause Analysis of problems in implementation of telemonitoring via B2B, and possible improvements via the B2C approach.

Key Partners

MONITORING & WELLNESS
1) Strategic alliance between payer/regulator and distributor/promotor,
2) Cooperation between healthcare provider and equipment manufacturer,
3) Joint venture between equipment manufacturer and distributor/promotor, and
4) Buyer-supplier relationship between insurer/regulator and healthcare provider

Key Activities

MONITORING
1) Production – Creating the mobile app.
2) Problem solving – Care coordination and bidirectional communication, and
3) Platform/Network - 24/7 unobtrusive telemonitoring

WELLNESS
1) Production – Creating the mobile app,
2) Problem solving – Wellness tracking and support

Key Resources

MONITORING
1) Physical - Telemonitoring center,
2) Financial - initial investment in the venture,
3) Intellectual - IP and algorithms, and
4) Human - Telehealth nurses

WELLNESS
1) Physical - Telemonitoring center,
2) Financial - initial investment in the venture,
3) Intellectual - IP and algorithms

Value Propositions

MONITORING
24/7 unobtrusive personalized telemonitoring (disease monitoring, education, serious games and communities) with biweekly calls from a personal care coordinator (telehealth nurse)

WELLNESS
Wellness tracking (disease tracking, education, serious games and communities)

Customer Relationships

MONITORING
1) Dedicated personal assistance,
2) Automated alerts and messages, and
3) Communities

WELLNESS
1) Automated alerts and messages, and
2) Communities

Channels

MONITORING & WELLNESS
1) Distribution of the app/service via the established app stores,
2) Communication with patients via telecom operators

Customer Segments

MONITORING
1) CHF patient after an adverse event,
2) Tech savvy with smartphone and mobile internet, and
3) Able to pay for the service

WELLNESS
1) Older than 55 years and at cardiovascular risk,
2) Tech savvy with smartphone and mobile internet, and
3) Able to use the service

Cost Structure

MONITORING
1) Telemonitoring equipment
2) Telecommunication charges
3) Salaries
4) Overhead

WELLNESS
1) Backend charges
2) Telecommunication charges

Revenue Stream(s)

MONITORING
Subscription based (premium model)

WELLNESS
Free (freemium model)

Adapted from Business Model Generation (Osterwalder & Pigneur, 2010)

Figure 1: The B2C model of telemonitoring CHF expressed in the Business Model Canvas

Customer Segments

At the very beginning of the business model generation, we need to understand for whom is the value created, to: Mass Market, Niche Market, Segmented, Diversified or Multi-sided Platform (Osterwalder and Pigneur, 2010). Cambridge University Press (2015) explains that "Product … designed for the mass market is intended to be bought by as many people as possible, not just by people with a lot of money or a special interest", and Market segment is defined as "a group of possible customers who are similar in their needs, age, education, etc.". This model concerns CHF patients, as CHF contributes the most to mortality from chronic diseases in the world (WHO, 2011), making this a segmented market.

The newly crafted business model caters for the specific customer segment, i.e. CHF patients with a certain severity of the disease expressed in the New York Heart Association (NYHA) framework (Dolgin, 1994). It is too early to say which class of patients – NYHA class I to IV – can benefit the most from B2C telemonitoring, or whether it is a cost-effective intervention. For the time-being we will consider all NYHA class patients as possible customers. The criteria for the customer are: 1) CHF patient after an adverse event such as a heart attack or stroke for the *monitoring track*, and/or older than 55 years for the *wellness track*, 2) tech savvy with smartphone and mobile internet, and 3) able to pay for the service. In the US 17% of the daily mobile internet users older than 55 years purchased a service or a product via smartphone, and have on average 5.7 paid apps on their devices (Google, 2013). Thus the value proposition, distribution channels, and customer relationships need to be tailored to the specific requirements of this customer segment.

Value Proposition(s)

A Value Proposition "creates value for a Customer Segment through a distinct mix of elements catering to that segment's needs" (Osterwalder and Pigneur, 2010). The same authors define values as quantitative (e.g. price, speed of service) and qualitative (e.g. design, customer experience). What value can be delivered to the identified customers via the B2C model? Several, from the following categories: Newness, Performance, Customization, Getting the Job Done, Design, Brand/Status, Cost Reduction, Risk Reduction, Accessibility and Convenience/Usability (Osterwalder and Pigneur, 2010).

The key success factors, in terms of customer needs – effectiveness, costs, accessibility, ease of use, credibility – correspond to the value-added characteristics of the B2C model. The duration of intervention, the modus and time of introduction, education and self-management, the effectiveness in terms of better healthcare outcomes, are all important improvement points for B2B, and at the same time value propositions for B2C telemonitoring. The B2C value proposition is inspired by Triple Aim (Berwick *et al.*, 2008) and specified for telemonitoring of patients with CHF from a consumer's perspective. As such, the key success factors of the B2C model address different aims: Care (e.g. accessibility, ease of use, credibility), Health, and Costs (e.g. cost reduction, effectiveness, scalability).

An example of the B2C telemonitoring service that we will use in this business model generation exercise concerns: 1) a 24/7 unobtrusive personalized telemonitoring service (monitoring, education, games, and communities) with biweekly calls from personal care coordination, or for a wider audience of 55+ years, 2) a wellness tracking app (disease tracking, education, games, and communities). Personalized monitoring entails algorithm pushing nudges, content, education, and scripted interactions to the patient according to the signal reads from the monitoring devices. Personal care coordinator is a dedicated telenurse that monitors the patient via a dashboard, and acts as the "health coach" (supports the patients throughout their patient journey). The personalization on the patient side is driven by the severity of the disease , therapy adherence, willingness to pay, motivation, etc.

In the event of an emergency, or during the night when the patient is not supervised by a real person, the clever algorithm flags the situation and logs an automatic call with an emergency service on behalf of the patient (Leijdekkers and Gay, 2008). The telemonitoring service should not be mistaken for an emergency service.

Currently, telemonitoring can be provided via several platforms (e.g. smart and mobile devices, TV, telephone) but is executed in a *one-size-fits-all* fashion. Each patient is unique, and the customization of the service is a crucial part of the value proposition in the B2C approach. This can be done via smart algorithms using educational content, surveys, information

provision, games, etc. – all personal and engaging. Patients a are happy when care is tailored to them personally and/or to their individual needs (Minvielle *et al.*, 2014).

The brand power is crucial to service uptake. Aaker (1991) provided a framework for assessing brand equity with four dimensions: brand's perceived quality, brand awareness, brand associations, and brand loyalty. Patients might not be comfortable with IT companies monitoring their health, nor allow "one's biometric indicators [to] be constantly measured, analyzed and displayed publicly on Facebook or Twitter" (Lupton, 2012), but the recently introduced ResearchKit from Apple proves that things are beginning to change – smartphones will track one's health status, and even one's genetic information – and thousands of people have signed up for this already (Regalado, 2015). An established player in the healthcare domain with a strong brand has a fair shot at monitoring wider populations. In this way, the adoption of a new technology can be accelerated (Jin and Li, 2012).

B2C value proposition features cost reduction, risk reduction, accessibility and convenience/usability. It has a similar proposition to B2B, where customers essentially buy "peace of mind", but with more convenience as the service runs on a personal device and is considered "device-agnostic". It also reduces costs for the customer, as there is no need to install the equipment or to run updates. There is no "downtime risk" as the service is hosted in the cloud – the top 10 cloud services have downtime of less than 99.86% (Gagnaire *et al.*, 2012). Convenience is assured by unobtrusive telemonitoring, via third party devices, and seamless connection via a backend, over mobile internet. This value proposition allows accessibility to a first-class healthcare service, which is assured even in the areas where such medical service was previously unheard of. According to the International Telecommunication Union (2014) there are almost 3 billion internet users, two-thirds of them in the developing world, and the number of mobile-broadband subscriptions reached 2.3 billion globally. Smartphones and mobile internet are prerequisites for enjoying 24/7 coverage and medical service via the B2C telemonitoring model. With accessibility comes scalability, a necessary but not sufficient condition.

Channels

Channels are crucial in reaching a designated Customer Segment. Osterwalder and Pigneur (2010) distinguish between direct channels (e.g. sales force, web sales) and indirect channels (e.g. own stores, partner stores, wholesaler), as well as between owned channels and partner channels. Finding the right mix is important for successfully bringing the value proposition to the market.

The focus of the B2C model lies on locking-in the customers with a superb value proposition, by establishing a relationship with the personal health coach (i.e. telehealth nurse) rather than on owning the channels for marketing or distribution. The B2C model in telemonitoring should rely on distribution of the app/service via the established (app)stores, while the communication with patients should be executed in a secure and controlled manner via telecom operators (Deutsche Telekom, 2015; Frost & Sullivan, 2015).

This is a departure from the historical channel for telemonitoring, i.e. hospitals. Several factors that hamper wider deployment of telemonitoring if executed within the hospital setting, i.e. lack of funding, motivation and cooperation between the hospital and the GP (Willemse *et al.*, 2014), can be eradicated by new ways of healthcare delivery. B2C utilizes new channels and customer relationships in order to raise awareness of and extend the reach of telemonitoring.

Customer Relationships

Osterwalder and Pigneur (2010) distinguish between several categories of Customer Relationships, which may coexist in a provider's relationship with a particular Customer Segment: Personal Assistance, Dedicated Personal Assistance, Self-service, Automated Services, Communities, and/or Co-creation.

CHF patients can establish three types of relationships via the B2C model: dedicated, automated and community-based, depending on the choice of the service model, premium monitoring service or freemium wellness service.

Patients who pay, or are sponsored to enroll in the telemonitoring service, can receive dedicated personal assistance from a telehealth nurse (i.e. bimonthly calls and check-ups). Suter *et al.* (2011) find that "during

... assessment calls, telehealth nurses often provide education regarding cause and effect relationships between personal health behaviors and obtained physiological results, serving to reinforce prior teaching regarding disease self-monitoring and self-management" (p. 87), thus unequivocally supporting the crucial role played by telehealth nurses in telemonitoring. Patients/customers who download the app for free, and are on the wellness track can have automated services (e.g. education, games, and reminders). Both segments should enjoy communities, i.e. online forums for exchange of experiences and information in a similar fashion to PatientsLikeMe (Wicks *et al.*, 2010).

Revenue Streams

Revenue Streams represent the cash a company generates for each Customer Segment (Osterwalder and Pigneur, 2010). We believe that the strongest motivation for patients with chronic diseases, the value proposition one is willing to pay for, is "peace of mind" – knowing that someone is looking after you at all times.

Bradford *et al.* (2005) investigated the willingness to pay for telemedicine and found that 30-50% of hypertensive patients are willing to pay at least $20 per month, while for the CHF patient this number was even higher. Qureshi *et al.* (2006) found that "the majority of those choosing telemedicine (95%) were also willing to pay a median of $25 (5 to 500 dollars) out of pocket", while Seto (2008) found that 55% of heart failure patients were willing to pay $20, and 19% were willing to pay $40. In a more recent poll of 2019 customers, the result showed that the majority (62%) thinks that a telehealth visit should cost less than an in-person visit, which currently costs $82 for first-time patients (American Well, 2015). These payments can be a part of two different types of revenue streams: transactional revenues, i.e. one-off payments, and/or recurring revenues.

The B2C approach for telemonitoring chronic diseases revolves around subscription. The app/service can be free for the wellness track (freemium service with videos, education, and tracking of disease progression) and subscription based for the monitoring track (premium service consisting of telemonitoring, coaching, contact with telehealth nurses, and coordination of care).

Key Resources

Resources allow an enterprise to create and offer a value proposition, reach markets, maintain relationships with customer segments, and earn revenues (Osterwalder and Pigneur, 2010). Key resources in this venture are physical (telemonitoring center), financial (initial investment in the venture), intellectual (IP and algorithms) and human (telehealth nurses). We will explore the crucial two, without which it would be impossible to extend the B2B model towards B2C. Telehealth centers are a new organization of healthcare services for the digital age, ready to handle the complexity of the care-coordination process in telemonitoring, while telehealth nurses are specially trained providers of those services.

Telehealth Nurses

Telehealth nurses are seen as "health-quarterbacks" in charge of organizing and implementing care protocols for chronic/multimorbid patients (Monroe, 2014). Their role is in care-coordination between the patient, the physician, the pharmacist, and the informal caregiver. It should be noted that a proper relationship between the patient and the telehealth nurse should be established and maintained, to prevent confusion for the patient about who is in charge of their wellbeing in the complexity of healthcare (Span, 2015). Effective chronic care management is based on interaction between the healthcare professionals and the patient's social support network (Klasnja and Pratt, 2012). The patient allows and introduces one or more informal caregivers into the care-coordination chain, while the telehealth nurse manages the stakeholders. This is all possible with the current state of technology.

The telehealth nurse provides a personalized care to patients enrolled in the telemonitoring service. On average, he/she contacts the patient every two weeks, for a 10-minute check-up. This is adequate time for a quick conversation, as patients usually get only 10-15 minutes with their physician once every three months (Kaplan et al., 1995; Oxtoby, 2010). This allows one nurse to monitor and communicate with approximately 50 patients a day, or a maximum of 500 patients per month (with one monthly contact one nurse would be able to monitor almost 1000 patients). This is somewhat similar to the existing telemonitoring service in Hull, UK, where one telemonitoring nurse oversees 200-400 CHF patients

(Anon, 2014b). Telehealth nurses could be trained in order to reach the efficiency level needed to maintain the cost-effectiveness of the B2C model.

Telemonitoring Center

The B2C model introduces another entity to healthcare – a telemonitoring center – in order to provide 24/7 digital monitoring on smartphones (or a mobile device of the user's choice). The telemonitoring center is a physical entity that hosts telehealth nurses and the equipment, and performs two functions: telemonitoring and communication with patients. The monitoring part is automatic/algorithmic and runs in the background, while the communication between the telehealth nurse, the patient and the care team occurs during working hours.

The monitoring service proposed here should personalize the experience for each patient. For patients that have an older set of measuring devices (e.g. weight scale, blood pressure cuff, ECG recorder, pulse oximeter) the measurements should be entered into the app manually. This is usually tedious and error prone, but with the new automated equipment that connects via telephone or internet the transfer of the measurements is automatic and unobtrusive (Chaudhry *et al.*, 2007). The B2C model is device-agnostic as not to restrict the telemonitoring service to device manufacturer silos, and because peripheral measuring devices might soon be commoditized (c.f., Iivari *et al.*, 2016).

The communication system can be built on top of various unifying communication platforms, which allow for video calls, voice calls, instant messaging and presence (Winters and Hanna, 2012). This can be supplemented with email and an SMS/MMS service for sending pictures and educational materials. The Health Insurance Portability and Accountability Act of 1996 (US) demands that telemonitoring networks take precautions in order to prevent third parties from intercepting health-related data (Pecina *et al.*, 2011). There are many existing systems which are HIPAA compliant (i.e. full support of privacy issues) and can be readily deployed around the globe to ensure secure communication with patients.

Key Activities

Key Activities are required in order to create and offer a Value Proposition, to reach markets, maintain Customer Relationships, and earn revenues (Osterwalder and Pigneur, 2010). Key Activities can be categorized into: Production, Problem solving and Platform/Network.

The monitoring service can reuse the design, algorithms and functions of the established B2B telemonitoring platforms (i.e. physical systems) but adapt them to the B2C context (i.e. cloud services), in order to achieve scale and reach. This represents a departure from a product-oriented to a service-oriented approach. By introducing electronic distributors/promotors into healthcare delivery, the problem of population-wide healthcare coverage for chronic/multimorbid patients can be solved at regional, community, and individual levels (Kahn *et al.*, 2010). Recently one of the major insurers in the US, UnitedHealth, widened telehealth coverage to millions of Americans, finally removing one of the last obstacles to scale (Forbes, 2015).

Evolving the B2B model to seize this opportunity means introducing a new "platform" into healthcare (i.e. the telemonitoring center) that performs key activities: 24/7 unobtrusive telemonitoring of patients with chronic diseases (CHF in this case), bidirectional communication with patients, and care coordination by telehealth nurses.

Key Partnerships

The Key Partnerships describe the network of suppliers and partners that make the business model work (Osterwalder and Pigneur, 2010). In order to take telemonitoring out of the hospital setting and into the telemonitoring center where customers can purchase a telemonitoring solution on their own, there needs to be governance and awareness, in addition to providers of healthcare and equipment manufacturers (Figure 2).

Governments aim to improve the performance of their healthcare systems (Smith *et al.*, 2001) and rely on hospitals and national licensing authorities to provide services and to regulate the healthcare market. Out of 58 counties in the world that currently have Universal Healthcare Coverage (Stuckler *et al.*, 2010) there are developed countries where the government is the payer and the regulator (e.g. Canada where the government pays for 70% of healthcare expenses) and countries where these roles are separated (e.g. the Netherlands). Governance, consisting of payers and regulators, is one of the four pillars that "hold" the B2C model.

People are usually made aware of the existence and availability of the telemonitoring service by physicians or public health authorities, but here we are advocating a new route – informing customers directly via mass media. Targeted mass media campaigns are often used to inform patients about specific health issues or to promote desired behavior – for instance, to increase the uptake of screening, vaccination or healthy nutrition (Coulter and Ellins, 2007), but rarely to inform these people about the availability of certain healthcare services in a jurisdiction. The extension of the B2B model towards B2C mainly involves the introduction of mass media, as a new type of channel for delivering healthcare services. Media, consisting of distributors and promotors, represents another important pillar of the B2C model.

Regarding partenrships, the new business model can create the strategic alliance between non-competitors – payer/regulator and distributor/promotor – working together to raise awareness and improve the management of chronic diseases in their jurisdiction. It also can create a buyer-supplier relationship between healthcare provider and payer/regulator, as public bodies might want to procure telemonitoring for certain groups of citizens. On the other end, a joint venture between equipment manufacturer and distributor/promotor can be expected as the B2C model relies heavily on informing the customers/patients about the availability of the service in their jurisdiction. Finally, cooperation – a strategic partnership between competitors – can be established between equipment manufacturer and healthcare provider as they both compete for the same customer/patient in the B2C model.

With the introduction of the B2C model for telemonitoring chronic or multimorbid patients a new way of delivering healthcare services will be achieved. Chronic patients will be "shared" between home telemonitoring (remote management) and traditional in-hospital services, while today Accountable Care Organizations are trying to introduce nurse telephone support and telemonitoring in an attempt to avoid readmission penalties (Burke *et al.*, 2013). This will take place as a symbiosis between the four sectors: healthcare, industry, government and media. Figure 2 depicts the four building-blocks of the B2C model and their relationship

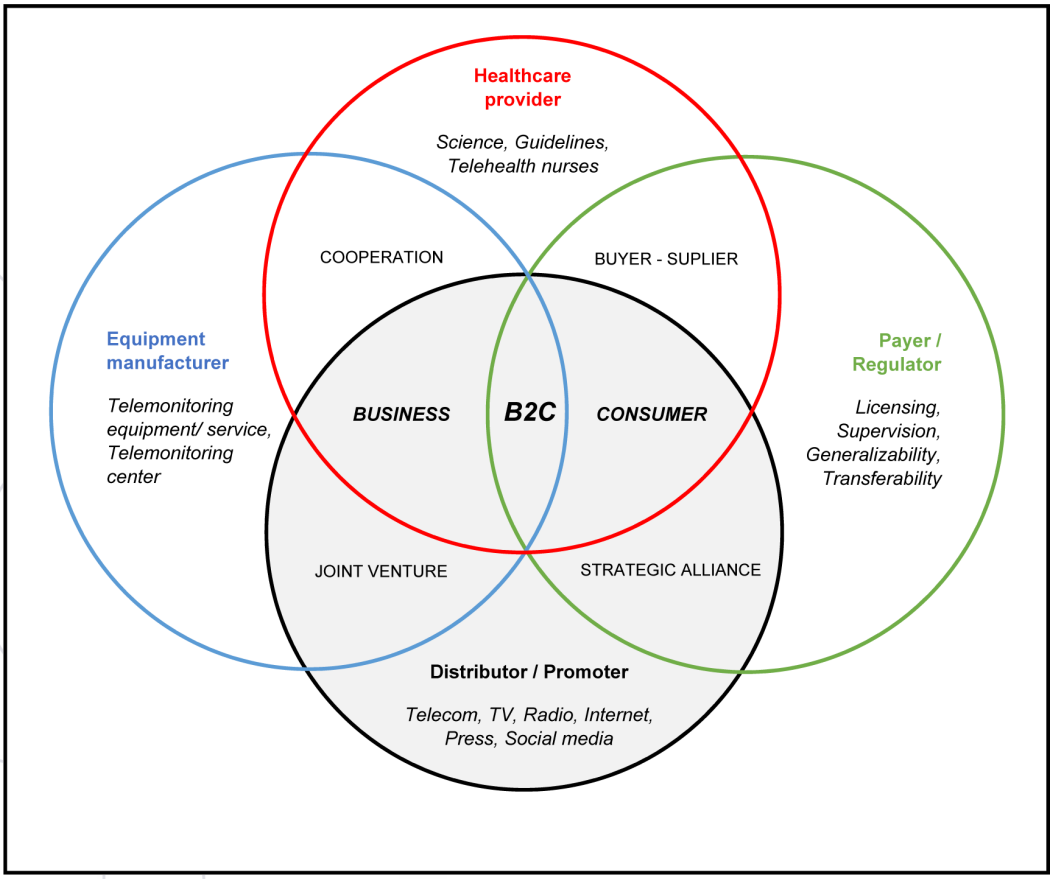

Figure 2: Key partnerships in B2C telemonitoring of patients with chronic diseases in a healthcare system where government is the payer and the regulator

with one another in a healthcare system where the payer and the regulator are the same body, i.e. the government.

Cost Structure

Costing is particularly important in delivering this value proposition to chronic or multimorbid patients. Creating and delivering value, maintaining customer relationships, and generating revenue all incur costs (Osterwalder and Pigneur, 2010). The costs can be fixed or variable, and the business can be cost-driven or value-driven. We believe B2C telemonitoring is value driven because it focuses on value creation for chronic or multimorbid patients, i.e. 24/7 unobtrusive monitoring, peace of mind, coordination of care, creation of communities, education, and help with self-management.

Discussion

The extension of the B2B business model into the B2C model for telemonitoring CHF presented here proposes a synergy between equipment manufacturers, healthcare providers, payers and regulators, distributors and promotors in order to achieve population-wide telemonitoring. It calls for the establishment of a telemonitoring center in an out-of-hospital setting, staffed by telehealth nurses, for reasons of effectiveness and efficacy. In this way telemonitoring can enable care to be provided in various settings (e.g. home, work, on the move), instead of having patients seek care in hospitals and care organizations. The B2C model connects the business side with the consumer side of telemedicine, as shown in Figure 2. It is our belief that extending the B2B model toward the B2C will increase the speed and scale of adoption of this technology in chronic disease management.

We presented our analysis in the Business Model Canvas by Osterwalder and Pigneur (2010) because of the methodological strength it embodies – a mediation between the idea and the customer (Coes, 2014). The advantage of the Canvas is in recognizing the key importance of the value proposition to the end customer of the B2C model – the patient. The limitation is in absence of a strategy portrait, and the relationship of the business model with a possible strategy. Teece (2010) theorized that the two are connected, where strategy follows business modelling. Thus, we tried to present possible strategic partnerships in Figure 2.

Coye *et al.* (2009) compiled an overview of the early business models for chronic disease management, finding that "all of the previous operations" were B2B and have proven unsuccessful in bringing telemonitoring to the masses. In these organizations the patients, i.e. the consumers, were not able to procure the service on their own. Evidently, in the beginning scalability, generalizability and transferability were trumped by implementation problems.

As with most products and services in healthcare, the B2B model is designed with a primary focus on providers. However, the B2C model breaks away from the traditional consideration of providers as key buyers and shifts the attention to patients themselves, recognizing their vital need for convenience, accessibility, and customized education. The B2C model capitalizes on the proliferation of smartphone devices, tablets and the rapid rise of the internet, and offers the solutions directly to patients, while breaking down the barriers created by intermediate functions.

The B2C model bears similarities to the *Blue Ocean Strategy* approach. Challenging an industry's conventional wisdom about which buyer group to target can lead to v*alue innovation* – i.e. the creation of innovative value to unlock new demand (Kim and Mauborgne, 2005). According to Kim and Mauborgne (2005) one approach to create a new uncontested market and satisfy demand from a previously overlooked set of buyers is to look across buyer groups. Since the B2C model shifts the perception in terms of the primary buyer group from providers to patients, and offers the latter group additional critical products/service attributes that unlock value, it bears many similarities to a blue ocean strategy.

However, the concept of value is not without problem in healthcare. Welfare economists still follow an influential concept by Hersany (1982, p. 55) that "in deciding what is good and what is bad for a given individual, the ultimate criterion can only be his own wants and his own preferences." In healthcare value is not expressed only as a personal preference for an outcome, but more typically as a "triple aim" (Berwick *et al.*, 2008): health gain, improving patient's satisfaction with care, and/or reducing per capita cost of care. The B2C model would most

likely not improve health, but deliver on other two types of value.

The B2C approach might also solve the transferability and generalizability issues in telemonitoring, explored in the Model for Assessment of Telemedicine (Kidholm *et al.*, 2010), by controlling for differences in demography and disease (telemonitoring works in the same way for different age and disease-severity groups), availability of healthcare resources (telemonitoring is available in a whole jurisdiction, irrespective of geography), variation in clinical practice (telemonitoring introduces the same standards of care), alignment of incentives to healthcare professionals and institutions (telemonitoring centers are outside the hospital setting), uniformity of costs and prices (the fee for a telemonitoring service is the same for everyone).

Three key characteristics of a good business model are alignment, self-reinforcement, and robustness (Casadesus-Masanell and Ricart, 2011). The B2C model in telemonitoring of patients with CHF is aligned with the goals of all four stakeholders and represents a middle ground between the business needs and the consumer needs. It is self-reinforcing because allowing patients to procure a telemonitoring service at their own request will help achieve the "triple aim" in healthcare (Berwick *et al.*, 2008) by improving the patient's experience of care, improving the health of populations and reducing the per capita cost of care. It will increase revenues and innovation in industry, help governments to fight chronic diseases while controlling the budget, and allow media to educate and lock-in customers.

This business model can sustain its effectiveness over a long period by fending off the threats of imitation, as it is difficult to replicate the established telemonitoring center in a jurisdiction, and holdup, as customers cannot exercise their bargaining power due to the interplay of stakeholders. In addition, it helps to avoid slack, as organizational complacency is not to be expected, and substitution, as new products can reduce the customer's perceived value of this service, but the stakeholders themselves can and should come up with new services (Casadesus-Masanell and Ricart, 2011).

Our analysis is not without flaws or potential bias. We assessed theoretical strengths, the potential usefulness and the success of extending the B2B model in telemonitoring of chronic diseases. We based our analysis on the convenience sample of published articles (Given, 2008). Potential weaknesses of the B2C model still remain to be identified. As we are not aware of similar studies or business models, convergence validation has not been assessed (Reis and Judd, 2000).

Future research should provide an in-depth assessment of the business model described, and a financial analysis of a fictitious venture that runs on the model presented here. Business modeling, like economic evaluation, should indeed be iterative and maximize the efficiency of R&D in health technology assessment (Sculpher *et al.*, 1997). There needs to be, in a similar fashion to early health technology assessment (Ijzerman and Steuten, 2011), an "early business model assessment".

The telemonitoring domain is increasingly being democratized and the proliferation of health gadgets will bring a myriad of new telemonitoring apps and services. The (WHO Global Observatory for eHealth, 2011) ascertains that "mHealth can revolutionize health outcomes, providing virtually anyone with a mobile phone with medical expertise and knowledge in real-time" (p. 17). We recommend that decision makers, industry leaders, healthcare professionals, media moguls and patients consider new modalities of healthcare delivery via technology, at a distance.

Conclusion

Telemonitoring is nowadays ubiquitous and cheap, mainly due to the penetration of mobile devices, but the established business models are restricting the speed and scale of the adoption of telemonitoring. We looked into the evolution of the *provider-oriented* approach (B2B) into a *service-oriented* approach (B2C). The cornerstone of the strategy is the value innovation, i.e. the strategic move that creates value for the market, while simultaneously reducing or eliminating features or services that are less valued by the current or future market. The market for the B2B telemonitoring consists of hospitals, while in the B2C model it consists of patients themselves.

In this paper we presented the extended model – B2C – for the telemonitoring of chronic heart failure, which takes into account the healthcare continuum and supports patients' health and well-being at home and on the move. This is achieved by taking the telemonitoring service out of the hospital setting and into a new entity – the telemonitoring center – and by introducing a fourth pillar to the existing B2B model – distributors and/or promotors. Hence, the patient becomes the customer of the telemonitoring service and the B2C model is born. With this maneuver a difference is to be expected in the speed and scale of implementation of telemonitoring for chronic/multimorbid patients. We believe that the B2C model, in combination with B2B, is key to population-wide telemonitoring in the 21st century.

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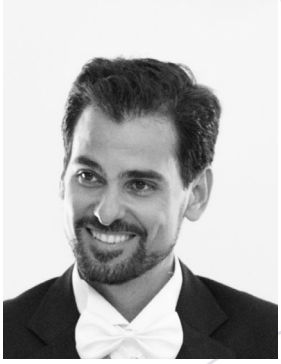
About the Authors

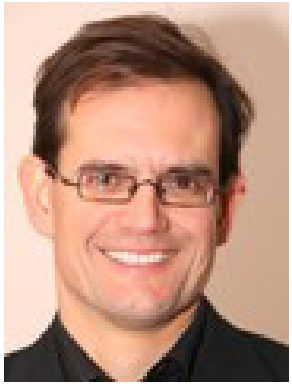


Andrija Grustam is a medical doctor, scientist and entrepreneur. He received his medical degree with honors from University of Belgrade, Serbia, while simultaneously working in the media industry. He was a cofounder of a start-up which was creating multimedia content for the national broadcasting service, internet and cell phone companies. He holds three M.Sc. degrees: in Public Health from Maastricht University in the Netherlands, in Healthcare Policy from L'École des hautes études en sciences sociales in Paris, France, and in Healthcare Management from Universitat Autònoma de Barcelona, in Spain. During the research presented here Andrija was working on business innovation in telehealth in Philips Research, and on health technology assessment of telemonitoring for chronic heart failure patients at the Erasmus School of Health Policy & Management, Erasmus University Rotterdam in the Netherlands. Andrija is currently pursuing a Ph.D., and is working as a Medical Director for eHealth and Patient Care in the oldest pharmaceutical company in the world, Merck KGaA.

Bert Vrijhoef is an international renowned expert in innovating care for people with chronic diseases and elders. Main themes in his work are: care coordination, e-Health, task shifting and teamwork, self-management support, and the advancement of applied health services and policy research. He leads multiple scientific studies at Tilburg University, Maastricht University Medical Center, Vrije Universiteit Brussel, National University Singapore, and National University Health System in Singapore. He has been/is a partner in various large-scaled, international research partnerships, including DISMEVAL (2009-2011), Project INTEGRATE (2013-2016), and Scirocco (2016-2019). His scientific work is translated in 200+ publications in (inter) national journals, book chapters and key-note lectures. Bert is the Editor-in-Chief of the International Journal of Care Coordination and member of the editorial board of ICT & Health. He holds a Master-degree in Health Policy and Management from Erasmus University (1996) and a Ph.D.-degree in Medical Sociology from Maastricht University (2002). Bert has received various awards for his work, including the Commonwealth Fund's Harkness Fellowship in Health Care Policy and Practice (2008/9).

Vasilis Poulikidis holds a B.Sc. in Business Administration and Management from Athens University of Economics and Business, and a M.Sc. in Strategic Management from the Rotterdam School of Management, Erasmus University Rotterdam in the Netherlands. He was a Research Analyst intern at Philips Research in Eindhoven and a Finance Analyst intern at Amazon in Luxembourg. He is currently working for Deloitte, in Strategy and Operations Consulting in Athens office. His research and business interests lay in firm's ambidexterity, strategic and business planning, and impact analysis.

Ron Koymans received his M.Sc. degree in mathematics from Utrecht University in 1982 and his Ph.D. degree in computer science from Eindhoven University of Technology in 1989. An updated version of his Ph.D. thesis has been published as a monograph in the Springer Lecture Notes in Computer Science series (Volume 651) in 1992. Since 1989 he has been an employee of Philips, currently in the position of Principal Architect within Philips Research. His research interests are service and business model innovation, health economics, and population health.



Hans Severens is a professor of Evaluation in Health Care at the Institute of Medical Technology Assessment, Erasmus University Rotterdam in the Netherlands. He holds a M.Sc. Policy and Management in Health Sciences from Maastricht University, and a Ph.D. from Radboud University Nijmegen, the Netherlands. From 2001 until 2009 he was appointed as professor of Medical Technology Assessment at Maastricht University and co-head of the department of Clinical Epidemiology and Medical Technology Assessment of the University Hospital Maastricht. Hans' work is focused on economic evaluations of health care technologies, either as a part of clinical trials or independent modelling studies. Since 2008 Hans is a full member of the Dutch National Health Council (GezondheidsRaad), and for over 7 years member of the Committee Farmaceutische Hulp (CFH) of the Health Care Insurance Board (CVZ), for drug reimbursement advice. He is a former member of the Board of Directors of the International Society of Pharmacoeconomics and Outcomes Research (ISPOR) and was co-editor of the scientific journal of this society (Value in Health) for 10 years. Hans is the immediate future Dean of the Erasmus School of Health Policy & Management in the Netherlands.

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