JOBM
Journal of Business Models

Exploring Potential Changes in the Business Model: The Impacts of Using Human-Centered Personal Data As A Resource

Tero Huhtala[1]*, Minna Pikkarainen[2], and Saila Saraniemi[3]

Abstract

Purpose: Services are evolving from generic to personalized, and the reverse use of customer data has been discussed in both academia and industry for the past few years. The aim of this study is to understand the potential changes in the business model when adopting a human-centered personal data management approach.

Design/Methodology/Approach: The primary data was gathered over the time in recorded and transcripted workshops, in which future personal data -based services were conceptualized by analyzing future scenarios from a business perspective.

Findings: The results have implications to theory and practice, indicating that adopting personal data management principles causes changes in the business model, which, if successfully managed, may provide access to more resources, potential to offer better value, and a larger business environment.

Research limitations/implications: Being a single case study imposes restrictions to the generalizability of the results. Employing a value creation perspective, and expanding the scope of this study to include actors from different sectors would improve the validity of the research.

Social implications: The study views the future business landscape with human-centered personal data management lenses. The exploration of the effects of an approach that benefits both people and businesses provides a positive societal aspect.

Originality/Value: While a few studies have examined the linkage between business models and personal data usage, no empirical studies have looked at how a company's business model may change due to adopting a novel personal data management approach. This paper shows one way to think about this issue.

Keywords: business model, personal data, preventive healthcare, personal data management, human-centered

Please cite this paper as: Huhtala, T., Pikkarainen, M., and Saraniemi, S. (2019), Exploring Potential Changes in the Business Model: The Impacts of Using Human-Centered Personal Data As A Resource Vol. 7, No. 2, pp. 51-70

1-3 Oulu Business School, University of Oulu

*Corresponding author

Introduction

The health care sector is slowly making progress towards preventive, predictive, personalized and participatory care and wellbeing (Hood & Flores, 2012; Baldwin, 2010; Collins & Varmus, 2015; Porter & Lee, 2013). Especially in preventive activities in healthcare, information is an essential factor, and personal data are invaluable in understanding what makes a person healthy or ill (Beirão, et al., 2017; Pinho, et al., 2014), and are the key to preventive healthcare (Ratia, et al., 2018; Hood & Flores, 2012).

However, utilizing data is not an easy task. The increasing worries about data privacy are frequently in the news and the ethics on the uses of personal data are topical. *MyData* is an approach on personal data management which has emerged in Europe to address needs of companies to access data while simultaneously fulfilling digital human rights (MyData Alliance, 2017; Koivumäki, et al., 2017; Kemppainen, et al., 2016). The target of this human-centered personal data management (i.e. MyData) approach is to enable decentralized management of personal data from different sectors improving interoperability and make it easier for companies to comply with tightening data protection regulations, while also allowing individuals to change service providers without proprietary data lockins (Poikola, et al., 2014).

For this target to become reality, companies aspiring to use human-centered data to advance their services need to consider the impacts of this approach on their business model. Organizations aiming to benefit from the increasing volumes of personal data often lack consistent business models and need external resources to create and capture new value (Frankenberger, et al., 2014). While the need to change or adapt the business model to achieve sustained value creation is acknowledged (Achtenhagen, et al., 2013), there is a research gap in the literature concerning business models in this field (Kemppainen, et al., 2016). While a few studies have examined the linkage between business models and personal data usage (Redman, 2015; Wang, 2012; Brownlow, et al., 2015), we are aware of no empirical studies having explored the potential impacts on the business model by the implementation of human-centered personal data management principles. In this study, our purpose is to understand how business model is perceived to be impacted when human-centered personal data management is used as an enabler for data accessibility, and when the data is used as a resource. We study this in the context of a preventive occupational healthcare service.

This study uses a case study approach with two case companies sharing a goal of understanding the potential changes in business model due to adoption of personal data management approach as an enabler, and due to using personal data as a resource. The results are of practical relevance for companies navigating in changing competitive environments. Understanding business model change is incremental to seize new business opportunities and to act as an approach to mitigate the risk of inertia to change (Achtenhagen, et al., 2013).

Background

Business models

Technological innovations have disrupted all sectors of business, and the pervasiveness and growing volume of data is perhaps the most impactful phenomenon of this advancement. Consequently, the capability to utilize the available data is an increasingly important competitive advantage for all businesses (Huhtala, 2018; Brownlow, et al., 2015). Keen and Qureshi (2006) argue that a company aiming to become a new entrant or create new business opportunities needs a business model to articulate the changes it needs or wants to make.

Traditionally, value exchange between actors, service, and the customer is seen as the flow of money, other benefits, resources and activities (Palo & Tähtinen, 2011). In addition of being descriptions of these key elements of business, business models have been approached as stories explaining how business works (Magretta, 2002); boundary objects made of narratives and calculations (Doganova & Eyquem-Renault, 2009); framing devices that influence and shape actions of business partners (Mason & Palo, 2012), as well as market devices that act in ways that enable companies and entrepreneurs to innovate markets (Doganova & Eyquem-Renault, 2009). While there are many definitions for 'business model' in the current literature (Baden-Fuller & Morgan, 2010; Chesbrough, 2007; Kindström, 2010), experts agree that they help companies of all sizes understand how to

convert resources and technological potential into economic value (Chesbrough, 2006). The business model is important to any organization because it provides means to understand, analyze, communicate and manage strategic choices (Al-Debei & Avison, 2010; Shafer, et al., 2005; Otjacques, et al., 2007). A convincing logic of value creation is imperative to succeed, and business models serve as conceptualizations to describe and implement that logic (Ghaziani & Ventresca, 2005; Willemstein, et al., 2007). Indeed, business models are constantly evolving in line with strategic decision making, mirroring this ongoing and iterative process (Magretta, 2002).

In addition to being developed, business models must also be managed, which is an inherently risky business. Commercializing an idea or technology is unsuccessful most of the times, and even when successful, it may create powerful inertia inside the company which makes it even harder to change their business model. (Chesbrough, 2006).

Theoretical investigations on business models go into specific components of the business model and how they help explain the business logic of companies. One of the most famous illustrations of the business model and its components is the Osterwalder Business Model Canvas (Osterwalder & Pigneur, 2010), a conceptual tool that makes expressing the business logic of a specific organization easier (Al-Debei & Avison, 2010). The components of the canvas are *key partners, key activities, key resources, value propositions, customer relationships, channels, customer segments, cost structure, and revenue streams.* There are more extensive interpretations of the business model components, as well. For example, Onetti et al. (2010) provided an analysis based on 70 different definitions published from 1996 to 2009. The work of Onetti et al. (2010) was inspired by Shafer et al. (2005), providing a reduced list of 26 components of business models. Despite being semantically slightly different, both interpretations represent same objective being not just depictions of reality, but also instrumental tools which can answer the same questions regarding the prospective future of the company (Doganova & Eyquem-Renault, 2009). Doganova and Eyquem-Renault (2009) suggest that one of the most impressive feature of business models is that they are circulated among and presented for various stakeholders of the company, at the same time building the network for the company. Zott and Amit (2010) refer to this idea as "business models in action". We adopt the approach in this study as the case companies are cooperatively developing a business model. However, we opt to use the Osterwalder business model canvas as an analytical tool to capture the changes in the business model due to novel personal data management approach.

Personal data

Personal data is important currency for companies and society. The EU General Data Protection Regulation defines personal data as any information relating to an identified or identifiable person. (European commission, 2016). Personal data has long been collected for various benefits. Aggregating customer activity and history to understand the customer better and target marketing efforts more efficiently is a part of virtually every business. Gaining insight, efficiency and competitive advantage are the main reasons for collecting personal data (Ericsson, 2013). Utilizing vast amounts of personal data can bring business opportunities for service providers, helping them to cater to the needs of the individual consumers. However, customer data is often seen as competitive advantage which cannot be shared with other organizations (Ctrl-Shift, 2014). This is the current situation in which personal data is abundant but resides in silos. The MyData initiative strives to release the data from their silos, for the good of the businesses and the individual people.

There is an increasing interest among researchers and practitioners to investigate the value and various uses of personal data (Saarijärvi, et al., 2014). Mobile devices and wearable sensors are perpetually adding information to the vast repositories of personal data (Li, et al., 2011). Within health and wellness domain, the motivation to use this kind of data is typically found in self-reflection and the help it provides in lifestyle changes (Carver & Scheier, 2001). However, this data is currently benefitting mainly those who are already active – not those who would benefit the most; e.g. people with chronic diseases and poor eating and activity habits.

The legality in the use and sharing of personal data depends on the context in which it is used (Otjacques, et al., 2007). As the volume of personal data rapidly increases, so does the importance privacy and ethical

use of data. Data ethics draw foundations from computer and information ethics but refines the level of abstraction of enquiries from being information-focused to being data-focused. The extensive use of personal data, and algorithms to analyze them for decision support, coupled with the reduction of human involvement and oversight of automated processes, raise issues concerning the fairness, responsibility and respect of human rights. (Floridi & Taddeo, 2016). These concerns are reflected in recent regulations. For business organizations, the implementation of these regulations can increase the overall costs of harvesting personal data (Ctrl-Shift, 2014), but some see the regulations as good and fair frameworks allowing smoother operation in the business networks for all actors (Huhtala, 2018). Whichever actors do use personal data, must process it with sensitivity, since privacy issues and data protection can be challenging, especially in the healthcare domain.

There are many initiatives emerging around the globe with the aim of resolving these ethical issues. *MyData* is one of these human-centered data management approaches which aim to simplify data flow and open new opportunities for businesses to develop innovative personal data -based services while preserving privacy (Kemppainen, et al., 2016; Koivumäki, et al., 2017). The aim of the MyData approach is to provide individuals with the practical means to access, obtain, and use datasets containing their personal information. It is a novel approach in personal data management and processing, aiming to transform the current organization-centric system into a human-centered system, and regarding personal data as a resource the individual can access and control (Poikola, et al., 2014). The MyData principles state that personal data should be technically easy to access and use (principle no 1: *usable data*), individuals should have the right and practical means to manage their data and privacy (principle no 2: *human centered services*), and that personal data should be managed in a decentralized way to prevent any data lock-in situations (principle no 3: *open business environment*) (Poikola, et al., 2014).

Business models and personal data

The economic value of a technology remains unclear until it is commercialized in some way via a business model. Moreover, technology should have value for the individuals, i.e., customers for succeeding. (Chesbrough, 2007). The reason why companies are interested in access to personal data is the potential value that the added information might have for their services (Huhtala, 2018). In fact, many companies that fail to utilize data in their business are risking losing the competitive advantage in the market (Brownlow, et al., 2015). However, data is not a valuable resource for a company or customers, if it is legally inaccessible or cannot be commercialized through a business model. Woerner and Wixom (2015) argue that companies can change their business model by using data, analytics, and algorithms to explore new revenue streams, create or enter new markets, and novel sources of competitive advantage via data monetization and digital transformation.

Data privacy has been a vibrant topic for individual customers and companies for recently. As the worries of the ethical use of data increases, new models and new ways of deriving value from human-centered personal data are sought. Typically companies are using transformation process that is related to the firm ability to change their business models based on the external business environment (Aspara, et al., 2011). O*pen business environment*, the third principle of the MyData approach, means that personal data should be managed in a de-centralized way for value to be distributed accordingly. This kind of data sharing from different sectors can be approached with *open business models*. Originally the open business models were used by Chesbrough (2007) when describing value creation in an open innovation context. This is an approach in which an organization draws its ideas from openness such as free software, open source, as well as open content and standards (Frankenberger, et al., 2014). Open business models have been a frequently found concept in literature since 2006 when Chesbrough (2007) published his seminal book on the topic. There is a lack of studies that would focus on business model change and on the evolutionary business model changes (Aspara, et al., 2011). Additionally, there is a lack of consensus in the definition and understanding of the concept, which has led "open business model" to stand for two different kinds of openness. One stream of literature links it to a firm's research and development activities while other researchers understand the open business model more broadly, i.e., not focusing

on R&D activities (Frankenberger, et al., 2014). In this study we understand the open business model in the latter way, broadly.

The aim of this study is to understand the changes in the business model when novel personal data management approach is used as an enabler to gain access to a new resource – personal data. We use the components of the Osterwalder business model canvas to reflect the data-impacted business logic of an occupational healthcare provider through MyData principles. We believe this approach to be fruitful in understanding the effects of personal data usage from a business model change perspective.

Research Design

Despite its advantages and many examples resulting in sound theories, case studies are a debated methodology, and may require detailed justification as to why case study method has been chosen instead of any other method (Dul & Hak, 2008; Gerring, 2004). The qualitative case study methodology provides the authors the opportunity to explore this single case intensively and describe the studied phenomenon in context using various data sources (Baxter & Jack, 2008; Yin, 2009) with the aim to generalize into wider contexts (Gerring, 2004). This study can be classified as an *instrumental single case study* (Stake, 1995) wherein the case itself is of secondary interest, and the focus is rather on the investigated phenomenon, which in this study are the impacts on the business model due to access to a new driving data resource.

The research process was three staged, containing the following:

1. *The pre-understanding* stage consisted of literature review on business models, selecting the case companies, and planning the research methodology
2. *The data collection* stage wherein goal was to collect primary and secondary data for the case study
3. In *the interpretation* stage theoretical and managerial conclusions are explored

During the first stage, the authors conducted a literature review on business models and personal data to have a deep understanding of the phenomenon. Further, the authors identified two service providers who were willing to develop personalized preventive healthcare services using MyData principles, and pilot the value of personal data as part of personal wellness services.

In the second stage the authors prepared for the workshops. The use of multiple data sources is a paramount in case study research (Baxter & Jack, 2008). Thus, the primary data was gathered from four recorded and transcribed workshops in which the researchers and the case companies (represented by the two interviewees, respectively) conceptualized future oriented service scenario from a business perspective. In addition, secondary data included several more informal meetings, company information, the case company websites, CEO presentations and articles on the context of occupational and preventive health care.

The authors interviewed 1) the CEO of an occupational health care provider who had a mission to persuade people to start caring for their own wellbeing for the sake of both themselves and their employer, and 2) the CTO of a large business intelligence and enterprise information management solutions provider. Both companies have ambitions in the healthcare and wellbeing business. In this study, the occupational healthcare company will be referred as Health Co., and the business intelligence and enterprise information management solutions provider as Data Co. The two companies have identified a market gap in the healthcare domain in creating a new service that offers an analytical tool for burnout prevention. Both companies jointly explore the hurdles of developing this new service, referred to in this study as the *Wellness Engine.* The service is in its planning stage, without clear understanding what the stakes and roles of each company will be. The case companies agree that the service will initially most likely be a separate, co-owned company. However, both companies identify that a service like this would provide considerable value to all relevant stakeholders.

The purpose of the Wellness Engine is to identify burnout risk factors, and with data, identify the individuals or groups of people with a burnout risk as early as possible to anticipate and intervene before burnout has manifested and fatigue starts to affect their ability to work. Burnout is a unique type of stress syndrome

and is characterized by the loss of mental resources and diminished personal accomplishment (Cordes & Dougherty, 1993; Peeters, et al., 2005). The effectiveness of measures to prevent workforce burnout critically depends on managers' understanding of the burnout phenomenon and of the subtle indications of its emergence (Cordes & Dougherty, 1993). Although the means of preventive health care are in their infancy, they represent a huge business potential. The Wellness Engine is envisioned as a holistic service, in the form of a wellbeing-coaching application which could also provide summaries of employees' overall well-being in the organization anonymously, and help answer what factors make an individual employee, or group of employees, effective and valuable. This study explores the business model from the perspective of the Wellness Engine service.

To limit the effects of a monotonous interpretation, the data collection for this case study consisted of four workshops, in which both interviewees attended, along with researchers from the Digital Health Revolution -research project. However, not all researchers attended in every workshop. The workshop method consisted of several phases, each warranting a dedicated workshop. These phases were i) introduction to personal data, ii) understanding the customer perspective, iii) end-user and business value analysis, as well as iv) technical and regulatory analysis. Both the individual user and the business network are fundamental to the MyData approach; thus, the case was examined through the processes of *personas* (Cooper, 1999) and *customer journey* (Lemon & Verhoef, 2016) to increase the individuals' point-of-view, and through *value network analysis* (Allee, 2008) to gain insight into the business network level. Value network describes agents, typically suppliers and customers, who conduct actual value-creating transactions with the company (Ryall, 2013). The purpose of the first workshop was to increase the case companies' understanding about *MyData* personal data management principles, and the authors' understanding about the plans and ambitions related to the new service they plan to jointly create. In the second workshop, the goal was to identify the key aspects to consider in the proposed service from a customer perspective. In the third workshop the target was to explore the business landscape and value network for the new service from human-centered personal data management perspective. To gain an in-depth understanding of the case, end users were profiled, potential customers and key roles were identified, and value analysis was done from both end-user and business perspectives. The fourth workshop focused on technical and regulatory analysis in which the goal was to understand what technical and regulatory aspects can hinder the adoption of human centered personal data management principles.

Finally, in the third stage, we explored the research output and extended the literature review based on the results and reached theoretical and managerial conclusions. The analysis process was iterative and abductive, as is often the case in qualitative inquiry, with continuous interaction of empirical data and theory (Dubois & Gadde, 2002). The data set was first thoroughly reviewed and then analyzed using *thematic analysis,* one of the most common techniques in qualitative research (Guest, 2012). In this study, the authors reflected on the convergent aspects of MyData principles and business model components as the theoretical framework. These were approached through a case "Wellness Engine", a potential joint service of the two studied companies. A coding matrix was constructed that enabled the systematic analysis of the data (Robson, 2002), first from the perspective of business model components while reflecting on the MyData principles, both perspectives explored in the continuum of short- and long-term future.

The research process is illustrated in figure 1.

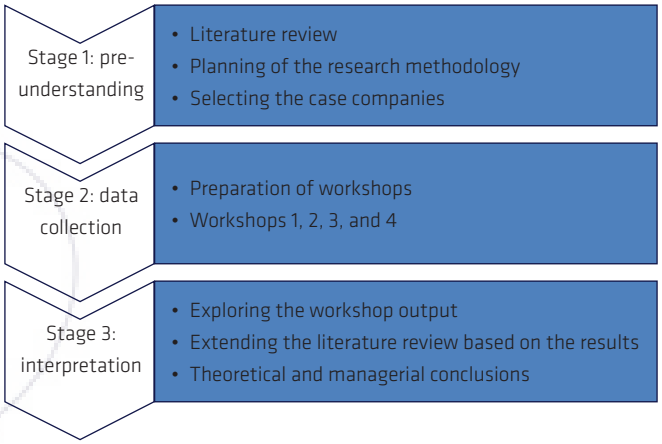

Figure 1: the research process of the study

Results

In this section, the business model components (Osterwalder & Pigneur, 2010) of the proposed joint service called Wellness Engine are discussed reflecting the MyData approach (Poikola, et al., 2014) from the perspectives of short-term -and long-term future. Table 1 illustrates the structure of the results chapter and summarizes the potential changes to business model components caused by the adoption of MyData approach and access to wide-ranging personal data. However, the table is necessarily a simplification, and as such, it is important to point out that some of the components discussed could be interpreted to fall under more than one MyData principle.

Usable data

According to MyData approach, personal data should be an important reusable resource that can be easily accessed and used. Companies that can first create and offer services that help individuals manage their lives can create novel business models and boost the economy. However, personal information as such is not easily capitalized. As far as utilization of personal data goes, there are two levels: individual personal data and the aggregated anonymized or pseudonymized data. Before an open business environment has taken hold and data-related regulations are carefully considered, this aggregate-level data is the asset that is worthwhile for industry players. Health Co. and Data Co. plan to use aggregated anonymized data to build the first version of the Wellness Engine data analyzing algorithm. They view personal data as a resource which helps differentiate their service. It is a resource which is not valuable by itself and can thus be shared without losing competitive advantage, and they can use customer data perpetually to improve their value proposition.

The legality in data use depends on the context (Otjacques, et al., 2007). Because of data protection regulations especially regarding sensitive medical data, the capabilities to ensure data privacy will be of utmost importance in the plans to utilize individual personal data. This is an aspect that need to be emphasized, because personalization of services - which the use of personal data enables – is one of the most valuable strategic benefits of using data to advance service (Lim, et al., 2017), and crucially so in the healthcare industry (Hood & Flores, 2012; Ratia, et al., 2018).

Next, the specific business model components related most closely to the *usable data* principle are discussed.

Key resources

Because of the role of data as an essential resource in preventive healthcare, Health Co.'s and Data Co.'s first goal is to identify the relevant data for the development of the Wellness Engine solution. The main data source on which the Wellness Engine will be built upon is data from Health Co. customers. However, only pseudonymized or anonymized personal data will be collected for developing the algorithm for the Wellness Engine. Sensitive personal information will not be collected at all, because of tight regulations which could hamper the development of the service's data analyzing algorithm.

> "We are building it (The Wellness Engine) using the data from healthy people using occupational health care services as reference datasets... (we will not use personal data) ...not in any circumstance, only mass data." –CEO Health Co.

Health Co.'s customer companies could provide added value to the Wellness Engine by agreeing to share data, such as standing and sitting metrics and work time statistics on an aggregated and anonymized level. However, the most valuable data would come from a variety of consented personal data.

> "-- (The Wellness Engine) ...can gain more than monetary value if companies could share work time statistics and other such data which is valuable in the development of the model (algorithm). --- If we got data from children, pensioners, and the marginalized citizens, that would really blow up to the pot. –CTO, Data Co.

Data can be used to generate useful information in many ways. Extant studies on using data for services reflect that useful data may come from the service provider (e.g. human resources, work time, etc.) or customers (e.g. activity, behavior), and may be useful to either or both (Lim, et al., 2018). As human-centered personal data management approach become more

	Short-term future			Long-term future			
Mydata principle / Business model component	Usable data	Human-centered services	Open business environment	Usable data	Human-centered services	Open business environment	Potential changes in Business model components
Key partners	N/A	N/A	Data Co. Statistics, application and measurement device providers	N/A	N/A	Data management companies, Insurance companies, platform operators, private hospitals, decision support system providers, international partners	New key partners
Key activities	N/A	N/A	Service development, ongoing business and regulatory environment analysis	N/A	Activities to improve value proposition by using data to personalize service	Developing interfaces to open business architecture for easy data access and sharing	New activity enabled by personal data as a resource New activities required to use personal data as a resource:
Key resources	Aggregate-level personal data, activity data	N/A	Domain expertise	All authorized personal data	Data protection (required by regulations) and data storage Data-analysis (from Data Co.)	Domain expertise	Wider source of personal data New resources required to use personal data
Value proposition	N/A	Occupational preventive healthcare augmented by data-analytics	N/A	N/A	Personalized and meaningful analysis and recommendations on the users' wellbeing based on various data sources	N/A	Improved value proposition
Customer relationships	N/A	N/A	Direct clients in occupational healthcare	N/A	N/A	Insurance companies, decision support system providers, individual users, foreign employer organizations	New customer relationships and roles enabled by open business environment
Channels	N/A	N/A	Customer companies	N/A	N/A	Health care operators, insurance companies	New channels enabled by open business environment
Customer segments	N/A	N/A	Employer organizations as customers	N/A	N/A	Public healthcare, foreign companies	New customer segments
Revenue streams	N/A	N/A	Revenues from selling more services to existing segments	N/A	Using aggregated data to further personalize value proposition or create new value proposition	Selling services to new customer segments	New sources of revenues New services enabled by personal data as a resource

Table 1: Impacts of human-centered personal data management (here MyData) principles on business model components on short and long-term.

widely accepted and adopted in the business environment, the integration of data becomes considerably easier. In the long run, authorized personal data from all relevant actors of the network are considered the driving resource for business.

> "---the MyData concept is a big thing here: (public data) it's public and in some sense a very open system, and if people would go for this and give their information. --- It's a great vision and societally impactful." -CEO, Data Co.

Human centered services

The second MyData principle has to do with the role of the human customer in services. According to Poikola et al., (2014) individuals should be empowered to have the right and means to manage their own data and privacy. The case companies are researching into how users could manage their own data. From the individual perspective, the aggregation and sharing of large amounts of personal data for the use of companies can raise anxiety. A common fear rising out of such data collection is whether the quality of data security is sufficiently robust, in addition to the fear of misuse of personal data (Weber, 2015). The companies are exploring the possibilities of linking their service to the Finnish national health and wellness database Omakanta. Managing data storage and data protection with an external partner is a valid option, allowing focus on core competencies (Huhtala, 2018).

In the following, specific business model components most closely relating to the *human-centered services* principle are discussed.

Key activities

A widespread adoption of the MyData approach would open data sharing between Health Co. and Data Co. and third players, enabling human-centered services. It would be possible to use different types of information - such as the customer data accumulated by retail chains, banks and biobanks - to give more comprehensive and holistic guidelines and advice. Other organizations could contribute in the development of Wellness Engine by, for example, providing work time- and other kinds of statistics. Early development of MyData architecture could offer a strategic benefit in the form of differentiation from their competitors for a short amount of time. The open business environment made possible by the MyData architecture will enable Health Co. and Data Co. to get access to a wider base of various data sets that enables the creation of new breakthrough service innovations before anyone else in the market. Essentially, there will be new activities enabled by personal data as a resource and new activities required to use personal data as a resource.

Key resources

When the Wellness Engine service can process and analyze individual personal data, there will also be a need for the capability to protect, anonymize or pseudonymize aggregated data, so no one can make any personal conclusions based on it. This need is driven by the legal and regulatory considerations regarding personal data in both national-, EU-, and global level. In summary, there will be change towards wider sources of personal data and new resources required to use personal data.

Value propositions

The short-term value proposition offered by Health Co. and Data Co. is a burn-out tracker service for working age population and an analytics machine that summarizes the data and then returns it back to the individual, but also to the company management and occupational healthcare players when needed. The long-term value proposition for the Wellness Engine service is personalized and meaningful analysis and recommendations on the users' wellbeing based on various data sources for occupational healthcare. The idea is that soon Health Co. could offer tools that can provide a big picture of the wellbeing of the workforce based on aggregated personal data.

> "...we can offer sophisticated tools and aggregated status information for HR management. --- I think it would be really useful if we could view a sales organization and its relevant energy levels: we could explore the levels of sleep, activity, and at what days the sales manager is most energetic, and if those pieces of information correlate. --- These are the kinds of information I'd love to see. -CEO, Health Co.

When there is a high burnout risk, the system will raise a red flag and provide guidelines for the person to slow down. When there are several red flags in the same

team or the same organization, the management will get information about it and some guidelines on how to improve the wellbeing of their employees in the workplace. If there are many red flags related to the same person, the information will be sent to the occupational healthcare provider that will then discreetly suggest to the person in question a visit to the doctor. With the Wellness Engine, Health Co. can offer their individual customers more efficient care based on continuous data analysis. In practice, employer organizations sign a contract with a service provider (i.e. Health Co.), and the management level of the employer organizations can use the analyzed data as basis for decision-making. There is also a possibility that decision support via the Wellness Engine could be offered to companies that are not direct customers of Health Co.

> ...Health Co. offers them (customers) occupational healthcare services, and the data analyses are included, but the Wellness Engine service can be sold to any company as a tool. The services can be sold directly to companies." –CEO, Health Co.

From the MyData point of view, it is important to consider what happens to the employee's data after they resign or retire. According to MyData approach, the individuals should be able to take their own data with them without fear of a data lock-in. As part of the value proposition, the data could be stored against a fee, or upon request, the individual could be entitled to receive their respective raw data file.

> "We don't have a solution for this currently. It could be that if there won't be any public database in which to preserve that (personal data), then it could be a paid service. So that we'll preserve the individual's data, but it'd cost some small amount. –CTO, Data Co.

Finland has recently opened a national personal health record *Omakanta* where people have basic tools to manage their respective wellness-related data. Omakanta works in tandem with another database, *Kanta*, which contains sensitive medical data for professional use. (Kansaneläkelaitos, 2019). At the time of our case study, the case companies were investigating the Finnish national personal health record and occupational healthcare links. All in all, the improved value propositions were expected to follow between the network actors from adopting MyData appproach.

Open business environment

The third MyData principle addresses the business environment. A widespread adoption of MyData approach leads to an open business environment, which enables "decentralized management of personal data, improves interoperability, makes it easier for companies to comply with tightening data protection regulations, and allows individuals to change service providers without proprietary data lock-ins" (Poikola, et al., 2014). In this study, most changes we identified in business model components, originate from the domain of the third MyData approach: open business environment. This insinuates that the role of the network, or the service ecosystem (see e.g. Vargo and Lusch, 2004; 2008), is increasingly important in the data-saturated modern world.

Health Co. has activity trackers partners etc. and has partnered with Data Co. do co-develop the Wellness Engine service. In the long run, collaboration with other stakeholders is sought for with the aim of gaining access to, for example, consented public health data and data from other private service providers, as well as the individual customers. However, many obstacles are in the way. Data protection regulations enforces strict codes of conduct for the use of personal data, but it also provides a common and predictable framework in which to operate. This alone is not enough for a truly open business environment and requires a systematic adoption open business models for all stakeholders in the business network. This, in turn, requires that the benefits of doing so trumps the costs related to it.

Next, specific business model components relating most closely to the *open business environment* principle are explored.

Key partners

Health Co. has an external health and activity data aggregation service, which they use primarily to offer their customers a simple solution to accumulate activity, sleep, pain, and nutrition data. In this service, a person can identify and select the subset of relevant metrics to be tracked. The sleep information comes via activity-trackers, authorized through user interface. Sleep duration and depth, and daily

activity, or steps are the most important datasets for the functionality of the Wellness Engine. Health Co. has an ongoing collaboration with the employer organization, and permission to collect the specified personal data from individuals it is providing its service for. However, if the used data is collected from other players in the business network, the individual's consent is required. Further, if Health Co. wants to offer the data to a third party, it must have the individual's consent and it needs to clearly indicate these purposes in its service terms. Health Co. can already get consented information about the people's status through their activity and sleep data aggregation service partner. The possibilities to acquire data for service development are vast, and it is conceivable that the Wellness Engine service could be co-created in collaboration with several other actors in their business network.

> "When it becomes clear what data we want in the near future, and when the business case is confirmed and validated, it's not out-of-the-question that other companies might be involved in the joint service in one way or another, considering they bring in some distinct added value." CTO, Data Co.

Current key partners in the Health Co. value network are companies that work on time statistics as well as other identified application and measurement device providers. Toward the future, it is important to search for new partners that enable the information flow between the services, like data management organizations, and other companies with relevant data, such as insurance companies, platform operators, private hospitals, decision support system providers, and international partners. Because of the varying nature of the occupational healthcare field in different countries, Nordic cooperation is considered important to model where the possibilities and problems are, and to see where pseudonymized data, data authorization, etc. fits into the business of both Health Co. The collaboration with public sector will happen later in the anticipated life cycle of Wellness Engine, when the open data business environment makes it possible for third parties to send and receive relevant data.

Data Co. is an essential partner in developing the Wellness Engine service as the source of expertise on developing the data analyzing algorithm. It is widely acknowledged that analytics can create new business opportunities and disrupt all industries (Ratia, et al., 2018; Woerner & Wixom, 2015). When reflecting this partnership through the open innovation research, Health Co. is innovating its business model with a *co-development partnership* (Chesbrough & Schwartz, 2007). Chesbrough and Schwartz (2007) argue that co-development partnerships are an increasingly potent way of developing the business model to improve innovation effectiveness.

Key activities

Initial key activities and processes in the business plan of Health Co. and Data Co. is to co-develop the first version of the Wellness Engine service, and make sure it will be legally sustainable regarding the use of personal data. Later, the role of open business architecture development for easy data access and sharing will be an increasingly topical activity.

> "So, our first case now is to build that burn out -indicator...Overall, it (regulatory analysis) would be pretty useful for us, so we won't build anything that's not legally possible." –CEO, Health Co.

Analytics processes will be essential to transform data into useful information for customers (George, et al., 2014). When the algorithm is ready, the Wellness Engine will need personal data from the users for testing. At first, the target is to get anonymized data, e.g., electronic health checks and an occupational health satisfaction survey on a monthly or so basis. Often people may give answers more honestly to an external occupational healthcare provider than to their employer organizations. However, Health Co. does not have direct access to the customer organization's employee data but can receive raw data upon consent.

Key resources

At the first phase, the key resources relating to open business environment are the customer contacts and preventive health care expertise of Health Co. and technical expertise coming from Data Co. In the long run, the resource base will widen as new data sources will become available. The respective domain expertise of the case companies remain important.

Customer relationships, customer segments, and channels

The aim of the case companies is to create a preventive occupational healthcare service solution, wherein data analytics and available personal data enables the services which can be sold to both public and private sectors, such as pension insurance companies and other public and private healthcare players and work organizations. Insurance companies will also become important channels in the future open business environment because they can offer personalized ways to motivate people to improve their daily lifestyle, offering more competitive insurance fees in exchange for healthier habits. In addition, pension insurance companies are important stakeholders even now, as they subsidize the cost of occupational healthcare services for companies. However, the current business model in *preventive* occupational healthcare is troublesome, because the regulations regarding preventive healthcare hinders its development. For example, the Finnish occupational healthcare laws date back to the 1970s; although the Finnish Centre for Pensions now subsidizes for occupational health e-services, it will not compensate for *preventive* occupational healthcare. This brings challenges in the current business model of Health Co.

> "Insurance companies and pension insurance companies pay directly to the companies for the services our customer organizations buy from us. That's how the money flows. --- I would like for the companies to pay (for our services) without subsidies. I think we have like a dozen clarifications going on with the Finnish Centre for Pensions regarding our client companies' subsidies..." –CEO, Health Co.

One possible option to sell the Wellness Engine solution is approaching the employer organizations abroad. It is a tempting direction of growth because, for example in Germany, the business models in occupational health care are different than in Finland: insurance companies could become direct clients of occupational healthcare services.

> "If we would go to German markets, there these insurance companies are the direct customers (of occupational health care), so it's a whole other business model." –CEO, Health Co.

Potentially, open business environment would enable new customer relationships and roles, new channels and consequently new customer segments.

Revenue streams

The motivation to utilize personal data is widely accepted and the benefits are immense especially in the healthcare sector (Hood & Flores, 2012; Beirão, et al., 2017; Ratia, et al., 2018). Chesbrough (2007) argues that technologies and data can be commercialized in many ways, which leads to many types of business value. The value of the Wellness Engine service, for example, means different business value for each of the respective case companies.

In the business landscape of the future, in which the data flow will be continuous with the consent of individuals, new types of revenue fees from different players will be important to analyze. Initially, the target is to get service fees through direct occupational healthcare service contracts, mainly with work organizations and state enterprises. In the long run, the customer potential is predicted to be in the multi-sided platforms of the personal data -utilizing actors. The value potential of the Wellness Engine will increase when there will be more end users, and thus, more data sources. When the Wellness Engine is completed, it could be licensed as a service for other companies' use, generating even more anonymized raw data, which would make analyses more accurate and valuable. Aside from employer organizations and the Finnish Centre for Pensions, the planned revenue for the Wellness Engine would come from subscription fees or service payments from individual users and private companies. For Data Co., being the other developer of the Wellness Engine, it is imperative to discover additional business to be made aside from a steady revenue stream via Health Co.

> "---if you think about Data Co.'s interests, Health Co. is a rather small actor. So, if we are to build this Wellness Engine together, I must think about finding additional business benefits, aside from Health Co. paying for the use of Wellness Engine for services. -CTO, Data Co.

> "In fact, Health Co. customers' fees are Health Co. revenues, but the algorithms and analyzing services of the Wellness Engine can be used by other

organizations aside from Health Co. customer organizations." -CEO, Health Co.

Of the business model components specifically for revenue streams, potential changes appearing would be new sources of revenues and new services enabled by personal data as a resource.

Discussion and conclusions

The purpose of this study was to explore the potential changes in the business model caused by adopting the MyData approach to gain human-centered personal data as a resource. The results revealed from our analysis are summarized in table 1. The contributions of our paper are two-fold. First: we are contributing to service science (see e.g. Spohrer and Maglio, 2008; Vargo and Lusch, 2004; Lim, et al., 2017) by discovering and describing the increasingly vital role of the business network, or ecosystem, in using and sharing data. Secondly: to the research on open business models, by providing an analysis on the changes the companies articulate in an open business environment (Wirtz, et al., 2016; Chesbrough, 2006; Voelpel, et al., 2004).

Perhaps the most prominent underlying reason for most changes in the business model components is the importance of the role of the business network, or ecosystem, in the future. This seems to accentuate the convergence of different industries, since in this business network, the healthcare industry, insurance industry and ICT are becoming increasingly involved, each providing valuable data to each other with the consent of the individual, in the hopes of creating mutual value.

The human-centered personal data management approach is seen as an enabler to create value from various and different sources of data. More importantly, the adoption of MyData approach may help companies comply with regulations and gain new business opportunities via new resources. However, data alone does not bring any value if it is not integrated with customer value through the business model. Further still, our study suggests that open business models may be helpful in capturing that value by making it possible to attain resources that are otherwise unavailable. Using open source software and data (open business model) and exercising business model in action by presenting the business model to various stakeholders to maximize network-level understanding of the business logic can result in the highest potential value for different stakeholders (Saebi & Foss, 2015).

The earlier discussed industry convergence encourages open business models through technology convergence and through the power of new market entrants, requiring wider business model adjustments. Thus, open business models can be used to understand the business opportunities the companies and their business network actors can gain over time by accessing personal data from different sectors. W e found that a co-development partnership (Chesbrough & Schwartz, 2007) can be an essential building block in a business model because the partnership may provide crucial resources required to utilize personal data: data analysis and management.

The aim of business models is to exploit a business opportunity by creating value for parties involved. The re-evaluation of the business model enables the companies and managers to reimagine the limits and potential of data as a resource in their value creation. This is in line with Amit and Han (2017) who argue that digitalization expands the resources that the companies can use in value creation.

Our study shows that the use of data as a resource might help involved companies to build value propositions that enable differentiation in their business models. Particularly, the results indicate that rich data from different sectors will open new opportunities for companies to create more personalized value propositions. In addition, our study posits that "data begets data", meaning that personal data used to provide useful information to the customer via data analysis may produce more available data to use further in data analysis, or in further refining value proposition. These data may come from various stakeholders and may benefit all respectively. Some authors (Casadesus-Masarell & Ricart, 2010) argue that business models are a set of relations and feedback loops between variables and their consequences, and it is in developing these cycles managers need to focus on. The capability that enables integration of business model among network actors is the ability of the company to establish new technologies as a basis for the innovation. This is a way

for the company to attract other companies in the service network to invest resources to the common service creation (Chesbrough, 2007).

An extensive research is still needed to explore the success factors and barriers of using data to advance service, and the logic of business must be clarified. In addition to adopting the notion of open business models for better data accessibility, companies need to consider the legal and regulatory framework. In fact, from the managerial viewpoint, a crucial issue is the extent in which the two of the company managers can take responsibility of the practical actions required for reacting to the impacts to the business model. The main challenge is that the accessibility and sharing of personal data is mainly dependent of the actions and decisions made by policy makers. As such, institutional collaboration and influencing are important: there are legacy regulations regarding occupational healthcare in Finland which hamper the business logic of occupation healthcare services, such as the fact that the Finnish centre for pensions does not compensate for preventive occupational healthcare.

The study's methodical strength is in detailed recorded discussions that were done together with the case companies. Nonetheless, this single case study is relying on a limited amount of data that was used to explore the potential changes in the business model caused by adopting a human-centered personal data management approach. It is argued that business models cannot be fully anticipated and that they are eventually learned over time through experimentation and trial-and-error learning (McGrath, 2010; Sosna, et al., 2010), much like the way *business model in action* is described to act. While it is inconceivable to anticipate everything regarding the changes in the business model in a rapidly changing technological context, our scenario-driven methodology is rationalistic in its exploration of "optimal" or evolutionary" strategy (Van der Heijden, 2005). Further research, including data from different sectors, e.g., the financial sector, and research focused on the value creation aspect of using data to advance service could strengthen the constructs that have been empirically fleshed out by using the case study.

Acknowledgment

This study was a part of a Tekes (Finnish Funding Agency for Innovation)-funded Digital Health Revolution (DHR) project, which made collaboration with the case companies possible, allowing us to collect data with several methods such as meetings and workshops. Sincere thanks to the active case companies and all the other colleagues from our DHR project.

References

Achtenhagen, L., Melin, L. & Naldi, L., 2013. Dynamics of Business Models–Strategizing, Critical Capabilities andActivities for Sustained Value Creation. *Long Range Planning,* 46(-), pp. 427-442.

Adner, R. & Kapoor, R., 2010. Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal,* 31(3), pp. 306-333.

Al-Debei, M. M. & Avison, D., 2010. Developing a unified framework of the business model concept. *European Journal of Information Management Systems,* 19(3), pp. 359-376.

Allee, V., 2008. Value network analysis and value conversion of tangible and intangible assets. *Journal of intellectual capital,* 9(1), pp. 5-24.

Amit, R. & Han, X., 2017. Value creation through novel resource configurations in a digitally enabled world. *Strategic Entrepreneurship Journal,* 11(3), pp. 228-242.

Amit, R. & Zott, C., 2001. Value creation in E-business. *Strategic Management Journal,* 22(6-7), pp. 493-520.

Aspara, J., Lamberg, J., Laukia, A. & Tikkanen, H., 2011. Strategic management of business model transformation: lessons from Nokia. *Management Decision,* 49(4), pp. 622-647.

Baden-Fuller, C. & Morgan, M., 2010. Business models as models. *Long Range Planning,* Volume 43, pp. 156-171.

Baldwin, G., 2010. Consumer-directed health care? Yes. Consumer-connected? Maybe. *Health Data Management,* 18(6), p. 28.

Baxter, P. & Jack, S., 2008. Qualitative case study methodology: study design and methodology for novice researchers. *The Qualitative Report,* 13(4), pp. 544-559.

Beirão, G., Patrício, L. & Fisk, R. P., 2017. Value cocreation in service ecosystems: Investigating health care at the micro,meso, and macro levels. *Journal of Service Management,* 28(2), pp. 227-249.

Brownlow, J., Zaki, M., Neely, A. & Urmetzer, F., 2015. *Data-Driven Business Models: A Blueprint for Innovation,* s.l.: s.n.

Carver, C. & Scheier, M., 2001. *On the self-regulation of behavior.* s.l.:Cambridge University Press.

Casadesus-Masarell, R. & Ricart, J., 2010. From strategy to business models and onto tactics. *Long Range Planning,* 43(-), pp. 195-215.

Chesbrough, H., 2006. *Open Business Models: How to Thrive in the New Innovation Landscape.* London: Harvard Business School Press.

Chesbrough, H., 2007. Business model innovation: it's not just about technology anymore. *Strategy and Leadership,* 35(6), pp. 12-17.

Chesbrough, H. & Schwartz, K., 2007. Innovating business models with co-development partnerships. *Research Technology Management,* 50(1), pp. 55-59.

Collins, F. S. & Varmus, H., 2015. A New Initiative on Precision Medicine. *The NEW ENGLAND JOURNAL of MEDICINE,* 26 February.372(9).

Cooper, A., 1999. The Inmates are Running the Asylum. *Berichte des German Chapter of the ACM Software-Ergonomie,* p. 17–17.

Cordes, C. & Dougherty, T., 1993. A Review and an Integration of Research on Job Burnout. *The Academy of Management Review,* 18(4), p. 621.

Ctrl-Shift, 2014. *Personal Information Management Services: An analysis of an emerging market,* London, UK: Ctrl-Shift.

Doganova, L. & Eyquem-Renault, M., 2009. What do business models do? Innovation devices in technology entrepreneurship. *Research Policy,* 38(10), pp. 1559-1570.

Dubois, A. & Gadde, L.-E., 2002. Systematic combining: an abductive approach to case research. *Journal of Business Research,* Volume 55, pp. 553-560.

Dul, J. & Hak, T., 2008. *Case study methodology in business research.* Amsterdam: Butterworth-Heinemann.

Ericsson, 2013. *Personal Information Economy: Consumers and the Evolution of Commercial Relationships. An Ericsson Consumer Insight Summary Report,* s.l.: s.n.

EU Information Commissioner's Office, 2017a. *Big Data, artificial intelligence, machine learning and data protection,* s.l.: ICO Information Commissioner's Office.

EU Information Commissioner's Office, 2017b. *Preparing for the General Data Protection Regulation (GDPR): 12 steps to take now,* s.l.: ICO Information Commissioner's Office.

European commission, 2016. *The EU Data Protection Reform and Big Data Factsheet 2016.* [Online] Available at: http://ec.europa.eu/justice/data-protection/files/data-protection-big-data_factsheet_web_en.pdf

Facebook, 2014. *Facebook Annual Report 2014.* [Online] Available at: https://s21.q4cdn.com/399680738/files/doc_financials/annual_reports/FB2014AR.pdf

Floridi, L. & Taddeo, M., 2016. What is data ethics?. *Phil. Trans. R. Soc. A,* 374(2083), pp. -.

Frankenberger, K., Weiblen, T. & Gassmann, O., 2014. The antecedents of open business models: an exploratory study of incumbent firms. *R&D Manage R&D Management,* 44(2), p. 173–188.

Galvagno, M. & Dalli, D., 2014. Theory of value co-creation: a systematic literature review. *Managing Service Quality,* 24(6), pp. 643-683.

George, G., Haas, M. R. & Pentland, A., 2014. Big data and management. *Academy of Management Journal,* 57(2), p. 321–326.

Gerring, J., 2004. What Is a Case Study and What Is It Good for?. *American Political Science Review,* 98(2).

Ghaziani, A. & Ventresca, M., 2005. Keywords and cultural change: frame analysis of business model public talk, 1975–2000. *Sociological Forum,* 20(4), p. 523–559.

Grönroos, C., 2017. On Value and Value Creation in Service: A Management Pespective. *Journal of Creating Value,* 3(2), pp. 1-17.

Grönroos, C. & Gummerus, J., 2014. The service revolution and its marketing implications: service logic vs service-dominant logic. *Managing Service Quality,* 24(3), pp. 206-229.

Grönroos, C. & Voima, P., 2013. Critical service logic: making sense of value creation and co-creation. *Academy of Marketing Science,* Volume 41, pp. 133-150.

Guest, G., 2012. *Applied thematic analysis.* Thousand Oaks, California: Sage.

Hood, L. & Flores, M., 2012. A personal view on systems medicine and the emergence of proactive P4 medicine: predictive, preventive, personalized and participatory. *New Biotechnology,* 29(6), p. 613–624.

Huhtala, T., 2018. Using personal data to advance prevetive healthcare services. *Journal of Service Science Research,* 10(1), pp. 77-115.

Iivari, M. et al., 2016. Toward Ecosystemic Business Models in the Context of Industrial Internet. *Journal of Business Models,* 4(2), pp. 42-59.

Kansaneläkelaitos, 2019. *Omakanta.* [Online] Available at: https://www.kanta.fi/omakanta[Accessed 27 5 2019].

Keen, P. & Qureshi, S., 2006. *Organizational Transformation through Business Models: A Framework for Business Model Design.* Hawaii, US., Proceedings of the 39th Hawaii International Conference on Information Sciences.

Kemppainen, L., Koivumäki, T. & Saraniemi, S., 2016. *Human-centered business models for platform operators in personal data management.* Poznan, Poland, 32nd IMP-conference.

Kindström, D., 2010. Towards a Service-based business model - Key aspects for future competitive advantage. *European Management Journal,* Volume 28, pp. 479-490.

Kish, L. & Topol, R., 2015. Unpatients –why patients should own their medical data. *Nature Biotechnology,* Issue 33, pp. 921-924.

Koivumäki, T. et al., 2017. Consumer acceptance of future mydata based preventive ehealth services: An Acceptance Model and a Survey Study. *Journal of Medical Internet Research (forthcoming).*

Lemon, K. N. & Verhoef, P. C., 2016. Understanding Customer Experience Throughout the Customer Journey. *Journal of Marketing: AMA/MSI Special Issue,* 80(Nov), p. 69–96.

Li, I., Dey, A. K. & Forlizzi, J., 2011. *Understanding My Data, Myself: Supporting Self-Reflection with Ubicomp Technologies.* Beijing, China, ACM New York, NY, USA, pp. 405-414.

Lim, C. et al., 2017. Using data to advance service: managerial issues and theoretical implications from action research. *Journal of Service Theory and Practice.*

Lim, C. et al., 2018. Customer process management: A framework for using customer-related data to create customer value. *Journal of Service Management.*

Magretta, J., 2002. Why Business Models Matter?. *Harvard Business Review,* p. 86–92.

Mason, K. & Palo, T., 2012. *Innovating Markets by Putting Business Models to Work.* Rome, Proceedings of 28th Industrial Marketing and Purchasing Conference..

McGrath, R., 2010. Business model: a discovery driven approach. *Long Range Planning,* 43(-), pp. 247-261.

Muegge, S., 2011. Business ecosystems as institutions of participation: A systems perspective on community-developed platforms. *Technology Innovation Management Review,* 1(2).

MyData Alliance, 2017. *MyData.* [Online] Available at: https://mydatafi.wordpress.com/

Onetti, A., Zucchella, A., Jones, M. & Mcdougall-Covin, P., 2010. Internationalization, innovation and entrepreneurship: business models for new technology-based firms. *Journal of Management and Governance,* 16(3), p. 337–368.

Osterwalder, A. & Pigneur, Y., 2010. *Business Model Generation.* New Jersey: John Wiley & Sons, Inc..

Otjacques, B., Hitzelberger, P. & Feltz, F., 2007. Interoperability of E-Government Information Systems: Issues of Identification and Data Sharing. *Journal of Management Information Systems,* pp. 1557-928X.

Palo, T. & Tähtinen, J., 2011. "A network perspective on business models for emerging technology-based services. *Journal of Business and Industrial Marketing,* 26(5), p. 377–388.

Peeters, M., Montgomery, A., Bakker, A. & Schaufeli, W., 2005. Balancing Work and Home: How Job and Home Demands Are Related to Burnout. *International Journal of Stress Management,* 12(1), p. 43–61.

Pinho, N., Beirão, G. & Patrício, L., 2014. Understanding value co-creation in complex services with many actors. *Journal of Service Management,* 25(4), pp. 470-493.

Poikola, A., Kuikkaniemi, K. & Honko, H., 2014. *MyData – A Nordic Model for human-centered personal data management and processing,* Helsinki, Finland: Finnish Ministry of Transport and Communications.

Porter, M. E. & Lee, T. H., 2013. The Strategy That Will Fix Health Care. *Harvard Business Review,* October.

Ratia, M., Myllärniemi, J. & Helander, N., 2018. The new era of business intelligence: Big Data potential in the private health care value creation. *Meditari Accountancy Research,* 26(3), pp. 531-546.

Redman, T., 2015. *Information and Technology: 4 Business Models for the Data Age.* [Online] Available at: https://hbr.org/2015/05/4-business-models-for-the-data-age

Robson, C., 2002. *Real world research: A resource for social scientists and practitioner-researchers (2nd ed.).* Oxford: Blackwell Publishing.

Ryall, M., 2013. The new dynamics of the competition. *Harvard Business Review,* June.

Saarijärvi, H., Grönroos, C. & Kuusela, H., 2014. Reverse use of customer data: implications for service-based business models. *Journal of Services Marketing,* 28(7), pp. 529-537.

Saebi, T. & Foss, N. J., 2015. Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. *European Management Journal,* 33(-), pp. 201-213.

Shafer, S., Smith, H. & Linder, J., 2005. The power of business models. *Business Horizons,* 48(3), p. 199–207.

Sosna, M., Trevinjo-Rodrígues, R. & Velamuri, S., 2010. Business model innovation through trial-and-error learning: The Naturhouse case. *Long Range Planning,* 43(-), pp. 383-407.

Spohrer, J. & Maglio, P. P., 2008. The emergence of service science: Toward systematic service innovations to accelerate co-creation of value. *Production and Operations Management,* 17(3), pp. 1-9.

Stake, R., 1995. Data Gathering. In: *The Art of Case Study Research.* Thousand Oaks, CA: Sage, pp. 49-68.

The World Health Organization, 2008. *World Health Report,* s.l.: s.n.

U.S. Department of Commerce, 2017. *Privacy Shield Framework.* [Online] Available at: https://www.privacyshield.gov/Program-Overview[Accessed 5 12 2017].

Van der Heijden, K., 2005. *Scenarios: The Art of Strategic Conversation.* 2nd ed. Chichester: John Wiley.

Wang, R., 2012. *What a big-data business model looks like.* [Online] Available at: https://hbr.org/2012/12/what-a-big-data-business-model

Vargo, S. & Lusch, R., 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing,* 68(1), pp. 1-17.

Vargo, S., Maglio, P. & Akaka, M., 2008. On value and value co-creation: A service systems and service logic perspective. *European Management Journal,* 26(-), p. 145– 152.

Weber, R., 2015. The Digital Future - a challenge for privacy?. *Computer Law and Security Review,* Volume 31, pp. 234-242.

Willemstein, L., van der Valk, T. & Meeus, M., 2007. Dynamics in business models: an empirical analysis of medical biotechnology firms in the Netherlands. *Technovation,* Volume 27, pp. 221-232.

Wirtz, B., Göttel, V. & Daiser, P., 2016. Business Model Innovation: Development, Concept and Future Research Directions. *Journal of Business Models,* 4(1), pp. 1-28.

Voelpel, S., Leibold, M. & Tekie, E., 2004. The Wheel of Business Model Reinvention - How to reshape your business model to leapfrog competitors. *Journal of Change,* 4(3), pp. 259-276.

Woerner, S. L. & Wixom, B. H., 2015. Big Data: Extending the Business Strategy Toolbox. *Journal of Information Technology,* 30(1), pp. 60-62.

Yin, R. K., 2009. *Case Study Research.* s.l.:SAGE Publications, Inc..

Zott, C. & Amit, R., 2010. Business Model Design: An Activity System Perspective. *Long Range Planning,* Volume 43, pp. 216-226.

About the Authors

Tero Huhtala (corresponding author), Oulu Business School, University of Oulu, tero.huhtala@oulu.fi. Tero Huhtala is a doctoral student at the Oulu Business School, University of Oulu, Finland. His current research interests reside in the study of digitally enabled services and especially in the use of data in advancing services.

Minna Pikkarainen, Oulu Business School, Faculty of Medicine, University of Oulu; VTT Technical Research Centre of Finland. 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. Currently Minna is focusing on her research in the data driven service co-creation, innovation orchestration and business models in health and wellbeing sectors. Before she was a professor, Minna's research focused on the areas of software development, agile development and service innovation.

Saila Saraniemi, Oulu Business School, University of Oulu. Dr. Saila Saraniemi is a Senior Lecturer of Marketing at Oulu Business School, University of Oulu, Finland. Her research interests include digitalization and value creation logics of services; corporate, service and place branding and business networks. She has published, among others, in European Journal of Marketing, Industrial Marketing Management, Journal of Product and Brand Management and Marketing Intelligence and Planning.