JOBM

Journal of Business Models

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.

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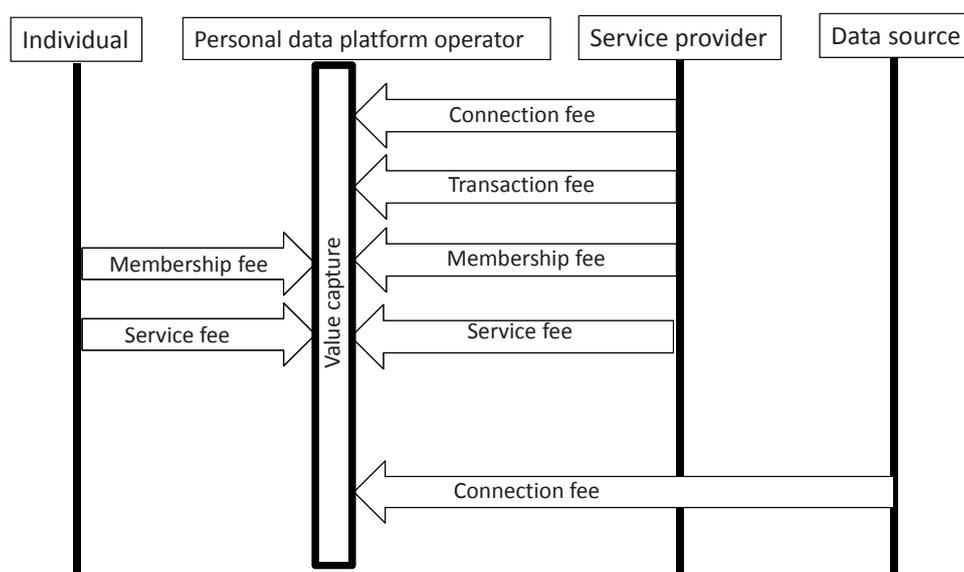
Figure 1: Revenue models and the key stakeholders of a personal data platform operator.

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.

References

Ahokangas, P. & Myllykoski, J. (2014). The practice of creating and transforming a business model. *Journal of Business Models*, 2(1), 6-18.

Amit, R., & Zott, C. (2012). Creating value through business model innovation. *MIT Sloan Management Review*, 53(3), 41.

Baden-Fuller, C. & Haefliger, S. (2013). Business Models and Technological Innovation, *Long Range Planning*, 46(6), 419-426.

Basit, T. (2003). Manual or electronic? The role of coding in qualitative data analysis. *Educational research*, *45*(2), 143-154.

Beyeler, W. E., Kelic, A., Finley, P. D., Aamir, M., Outkin, A., Conrad, S., Mitchell M. D. & Vargas, V. (2012). In: Yang, S. J., Greenberg, A. M. & Endsley, M. (eds.) *Social Computing, Behavioral-Cultural Modeling and* Prediction. Conference Paper. Berlin: Springer Berlin Heidelberg: pp. 314-321.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.

Breidbach, C.F. & Brodie, R.J. (2017). Engagement platforms in the sharing economy: conceptual foundations and research directions. *Journal of Service Theory and Practice*, Vol 27 No. 4.

Brownlow, J., Zaki, M., Neely, A. & Urmetzer, F. (2015). Data and Analytics - Data-Driven Business Models: A Blueprint for Innovation, Working Paper.

Brunn, P., Jensen, M., & Skovgaard, J. (2002). e-Marketplaces:: Crafting A Winning Strategy. European Management Journal, 20(3), 286-298.

de Montjoye, Y-A., Wang, S. S. & Pentland, A. S. (2012). On the Trusted Use of Large-Scale Personal Data. *IEEE Data Eng. Bull.* 35(4), 5-8.

Doligalski, T. (2018). Business Models of Internet Companies and Types of Goods Offered. *Journal of Business Models*, 6(2), 32-36.

Edelman, B. (2015). How to launch your digital platform. *Harvard Business Review*, 93(4), pp. 90-97.

Enders, A., Hungenberg, H., Denker, H-P. & Mauch, S. (2008). The long tail of social networking. Revenue models of social networking sites. *European Management Journal,* 26, 199–211.

European Commission. (2016). Protection of personal data. http://ec.europa.eu/justice/data-protection/. Accessed 27 January 2017.

European Union (2017). Revised rules for payment services in the EU. http://eur-lex.europa.eu/legal-content/EN/LSU/?uri=CELEX:32015L2366. Accessed 2 June 2017.

Evans, D. S. (2003). Some Empirical Aspects of Multi-sided Platform Industries. *Review of Network Economics*, 2(3), 191-209.

Evans, D. S. & Schmalensee, R. (2007). The Industrial Organization of Markets with Two-Sided Platforms, *Competition Policy International*, 3(1), 150-179.

Ferro, E., & Osella, M. (2013). Eight business model archetypes for PSI re-use. Paper presented at the ''Open Data on the Web'' Workshop, Google Campus, London.

Filistrucchi, L., Geradin, D., Van Damme, E. & Affeldt, P. (2014). Market definition in two-sided markets: Theory and practice. *Journal of Competition Law and Economics*, 10(2), 293-339.

Frow, P. & Payne, A. (2011). A stakeholder perspective of the value proposition concept. *European Journal of Marketing*, 45(1/2), 223–240.

Gandomi, A. & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management*, 35, 137–144.

Ghose, A. & Han, S. P. (2014). Estimating demand for mobile applications in the new economy.

Management Science, 60(6), 1470-1488.

Giesen, E., Berman, S. J., Bell, R., & Blitz, A. (2007). Three ways to successfully innovate your business model. *Strategy & leadership*, 35(6), 27-33.

Gnesi, S., Matteucci, I., Moiso, C., Mori, P., Petrocchi, M. & Vescovi, M. (2014). My Data, Your Data, Our Data: Managing Privacy Preferences in Multiple Subjects Personal Data. *Lecture Notes in Computer Science*. 8450, 154-171.

Gomes, J. F. & Moqaddamerad, S. (2016). Futures Business Models for an IoT Enabled Healthcare Sector: A Causal Layered Analysis Perspective, *Journal of Business Models*, 4(2), 60–80.

Gordijn, J., & Akkermans, H. (2003, January). Does e-business modeling really help?. In System Sciences, 2003. *Proceedings of the 36th Annual Hawaii International Conference* on (pp. 10-pp). IEEE.

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

Iivari, M. M., Ahokangas, P., Komi, M., Tihinen, M., & Valtanen, K. (2016). Toward ecosystemic business models in the context of industrial internet. *Journal of Business Models*, 4(2), 42-59.

Janssen, M., & Zuiderwijk, A. (2014). Infomediary business models for connecting open data providers and users. Social Science Computer Review, 32(5), 694-711.

Johnson, B.R. 1997 Examining the validity structure of qualitative research, Education, Winter 1997, 118, 2, Research Library, pp. 828

Kafentzis, K., Mentzas, G., Apostolou, D., & Georgolios, P. (2004). Knowledge marketplaces: strategic issues and business models. *Journal of Knowledge Management*, 8(1), 130-146.

Kemppainen, L., Koivumäki, T. & Saraniemi, S. (2016). Human-centered business models for platform operators in personal data management. *The paper was published at the 32nd IMP-conference in Poznan, Poland in 2016.*

Koivumäki T, Pekkarinen S, Lappi M, Väisänen J, Juntunen J, Pikkarainen M. Consumer Adoption of Future MyData-Based Preventive eHealth Services: An Acceptance Model and a Survey Study. *J Med Internet Res* 2017 (forthcoming). doi:10.2196/jmir.7821.

Kshetri, N. (2014). Big data's impact on privacy, security and consumer welfare. *Telecommunications Policy*, 1134-1145.

Laudon, K. C. & Traver, C. G. (2007). E-Commerce: business, technology, society. Pearson Prentice Hall, New Jersey.

Lepak, D. P. & Smith, K. G. & Taylor, M. S. (2007). Value creation and value capture: A Multilevel perspective. *Academy of Management Review,* 32(1), 180-194.

Li, F. (2017). The digital transformation of business models in the creative industries: A holistic framework and emerging trends. *Technovation*. Article in Press.

Lumpkin, G. T. & Dess, G. G. (2004). E-business strategies and internet business models: How the internet adds value. *Organizational Dynamics*, 33(2), 161–173.

Lusch, R.F. & Nambisan, S. (2015). Service Innovation: A Service-Dominant logic perspective. *MIS Quarterly,* 39(1), 155–175.

McGrath, M. & Scanaill C. (2013). Sensor Technologies, Healthcare, Wellness and Environmental Applications.

Magretta, J. (2002). Why business models matter. *Harvard Business Review*. 80(5), 86-92.

Mahadevan, B. (2000). Business models for Internet-based e-commerce: An anatomy. *California Management Review*, 42(4), 55-69.

Muzellec, L., Ronteau, S. & Lambkin, M. (2015). Two-sided Internet platforms: A business model lifecycle perspective. *Industrial Marketing Management*. 45, 139-150.

Osterwalder, A. & Pigneur, Y. (2002). An eBusiness model ontology for modeling eBusiness. *BLED 2002 Proceedings*, 2.

Osterwalder A. & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. Canada: John Wiley & Sons.

Pagani, M. (2013). Digital business strategy and value creation: Framing the dynamic cycle of control points. *Mis Quarterly*, 37(2), 617-632.

Papadopoulou, E., Stobart, A., Taylor N.K. & Williams, M.H. (2015). Enabling data subjects to remain data owners. *Smart Innovation, Systems and Technologies*, 38, 239-248.

Pentland, A. (2012). Society's nervous system: building effective government, energy, and public health systems. IEEE Comput. 45(1), 31–38.

Poikola, Kuikkaniemi, Honko (2015). MyData – A Nordic Model for human-centered personal data management and processing. Ministry of Transport and Communications. White paper. http://urn.fi/URN:ISBN:978-952-243-455-5.

Rayna, T., Darlington, J. & Striukova, L. (2015). Pricing music using personal data: mutually advantageous first-degree price discrimination. Electronic Markets, 25, 139–154.

Redman, T.C. (2015). 4 Business Models for the Data Age. *Harvard Business Review*.

Rehman, M. H., Chang, V., Batool, A. & Wah, T. Y. (2016). Big data reduction framework for value creation in sustainable enterprises. *International Journal of Information Management,* 36, 917–928.

Richardson, J. (2008). The business model: an integrative framework for strategy execution. *Strategic Change*, 17, 133-144.

Rietveld, J. (2017). Creating and Capturing Value From Freemium Business Models: A Demand Side Perspective. *Strategic Entrepreneurship Journal*.

Riquelme, H. (2001). Do consumers know what they want?. *Journal of consumer marketing,* 18(5), 437-448.

Roeber, B., Rehse, O., Knorrek, R- & Thomsen, B. (2015). Personal data: how context shapes consumers' data sharing with organizations from various sectors. *Electronic Markets.* 25, 95-108.

Rochet, J.-C. & Tirole, J. (2003). Platform competition in two-sided markets. *Journal of the European Economic Association*, 1(4), 990–1029.

Sabourin, V. (2016). Multi Sided Platforms (MSPs) Value Captation and Monetization Strategies: A Strategic Management Perspective. *Business Management and Strategy*, *7*(1), 189-205.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Sage.

Schweiger, A., Nagel, J., Böhm, M., & Krcmar, H. (2016). Platform Business Models. *Digital Mobility Platforms and Ecosystems*, 66-77.

Shafer, S. M., Smith, H., J., Linder, J. C. (2005). The power of business models. *Business Horizon*s, 48, 199-207.

Shin, D.-H. (2016). Demystifying big data: Anatomy of big data developmental process. *Telecommunications Policy,* 40, 837-854.

Spiekermann, S. & Novotny, A. (2015). A vision for global privacy bridges: Technical and legal measures for international data markets. *Computer Law & Security Review,* 31(2), 181-200.

Spieth, P., Schneckenberg, D., & Ricart, J. E. (2014). Business model innovation–state of the art and future challenges for the field. *R&d Management*, *44*(3), 237-247.

Tan, B., Pan, S. L., Xianghua, L. & Lihua, H. (2015). The Role of IS Capabilities in the Development of Multi-Sided Platforms: The Digital Ecosystem Strategy of Alibaba.com. *Journal Of The Association For Information Systems*, 16(4), pp. 248–280.

Tavory, I., & Timmermans, S. (2014). Abductive analysis: Theorizing qualitative research. University of Chicago Press.

Tucker, C. E. (2014). Social networks, personalized advertising, and privacy controls. *Journal of Marketing Research*, 51(5), 546-562.

Täuscher, K., & Laudien, S. M. (2017). Understanding platform business models: A mixed methods study of market-places. European Management Journal. 1-11. In Press.

van Putten, B-J. & Schief, M. (2012). The Relationship Between Dynamic Business Models and Business Cases. *Electronic Journal Information Systems Evaluation*, 15(1), 138-148.

Vargo, S. L. & Akaka, M. A. (2012). Value Cocreation and Service Systems (Re)Formation: A Service Ecosystems View. *Service Science*, 4(3), 207–217.

Vargo, S. L., Maglio, P. P. and Akaka, M. A. (2008). On value and value co-creation: a service systems and service logic perspective. *European Management Journal*, 26(3), 145-152.

Vescovi, M., Moiso, C., Pasolli, M., Cordin, L. & Antonelli, F. (2015). Building an Eco-System of Trusted Services via User Control and Transparency on Personal Data. *IFIP International Federation for Information Processing*, 454, 240-250.

Voelpel, S.C. Leibold, M. Tekie, E.B. (2004). The wheel of business model reinvention: how to reshape your business model to leapfrog competitors. *Journal of Change Management*, 4(3), 258-276.

Wang, Y., Tang, J., Jin, Q. & Ma, J. (2014). On studying business models in mobile social networks based on two-sided market (TSM). *Journal of Supercomputing*, 70(3), 1297–1317.

Wang, J., & Wang, Z. (2014). A Survey on Personal Data Cloud. *Sci. World Journal,* 13, Article ID 969150. doi:10.1155/2014/969150.

Weber, R. H. (2015). The digital future - A challenge for privacy? *Computer Law & Security Review,* 31, 234-242.

Wirtz, B. W., Schilke, O. & Ullrich, S. (2010). Strategic Development of Business Models: Implications of the Web 2.0 for Creating Value on the Internet. *Long Range Planning,* 43, 272-290.

Yablonsky, S. A. (2016). Multi-sided search platforms: global and local. *International Journal of Technology Marketing*, 11(3), 319.

Yin, R. K. (2015). Qualitative research from start to finish. Guilford Publications.

Zissis, D. & Lekkas, D. (2012). Addressing cloud computing security issues. *Future Generation Computer Systems*, 28(3), 583–592.

Zott, C., & Amit, R. (2007). Business Model Design and the Performance of Entrepreneurial Firms. *Organization Science*,18(2), 181-199.

Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. *Journal of management*, *37*(4), 1019-1042.

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.