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VALUE CREATION OF WELL-BEING DATA: OPPORTUNITIES FOR A NATIONAL PERSONAL HEALTH RECORD

UNIVERSITY OF JYVÄSKYLÄ
FACULTY OF INFORMATION TECHNOLOGY
2020

ABSTRACT

Koivisto, Niko
Value creation of well-being data: Opportunities for a national personal health record
Jyväskylä: University of Jyväskylä, 2020, 91 pp.
Information systems science, Master's Thesis
Supervisor(s): Kazan, Erol

The aim of this master's thesis is to examine the value creation potential of well-being data in a national personal health record. The amount of well-being data is growing exponentially as a product from the increased popularity of wearable devices. A large amount of the gathered data goes currently unused. For well-being data to be of use, it needs to be stored in large quantities. Well-being data can be stored in personal health records, through which the data can be viewed and managed. The Finnish Social Insurance Institution is developing a national personal health record where Finnish citizens will be able to upload their well-being data. The well-being data will be gathered by commercial solutions and will be able to be used by different healthcare specialists in the future. This project provides a lucrative opportunity to study the value creation of well-being data in a national personal health record. This research will provide insights into what is needed for well-being data to create value through a national personal health record. The research was conducted by first conducting a literature review on relevant literature. After this, an empirical qualitative research was conducted with data gathered through semi-structured interviews. The interviews were conducted on professionals with backgrounds in relevant fields to a personal health record, well-being data, health technology and healthcare. According to the study value can be created with well-being data through a national personal health record by providing enhancement to different entities through an easily accessible platform for different users. This allows value co-creation by these users and provides the basis for the public and private sector actors to work in balance, by allowing financial constructs to support the needed commercial actors.

Keywords: Well-being data, Value Creation, personal health record, health data, digital health, digital healthcare.

TIIVISTELMÄ

Koivisto, Niko
Hyvinvointidatan arvonluonti: kansallisen hyvinvointitietovarannon mahdollisuudet
Jyväskylä: Jyväskylän yliopisto, 2020, 91 s.
Tietojärjestelmätiede, Pro Gradu -tutkielma
Ohjaaja(t): Kazan, Erol

Tämän pro gradu -tutkielman tarkoitus on tarkastella hyvinvointitiedon arvonluontimahdollisuuksia kansallisessa hyvinvointitietovarannossa. Hyvinvointitiedon määrä on kasvanut räjähdysmäisesti puettavien älylaitteiden suosion kasvun seurauksena. Kerättyä hyvinvointidataa voidaan varastoida sille tarkoitettuihin tietovarantoihin, jotka mahdollistavat datan katselmoinnin ja hallinnoinnin. Kansaneläkelaitos on kehittämässä kansallista hyvinvointitietovarantoa, joka mahdollistaa kansalaisten hyvinvointitietojen tallentamisen. Hyvinvointietoja tullaan keräämään kolmansien osapuolien kehittämillä ratkaisuilla, ja sitä on tarkoitus hyödyntää terveydenhuollon ammattilaisten toimesta tulevaisuudessa. Tämä tutkimus tarjoaa näkökulmia tarvittaviin elementteihin, joilla hyvinvointitiedot voivat tuottaa arvoa kansallisen tietovarannon kautta. Tämä tutkimus toteutettiin koostamalla kirjallisuuskatsaus, jonka pohjalta toteutettiin empiirinen kvalitatiivinen tapaustutkimus, johon kerättiin tietoa puolistrukturoiduilla haastatteluilla. Haastatteluun osallistui hyvinvointitietoon, tietovarantoon, terveysteknologiaan ja terveydenhuoltoon liittyviä ammattilaisia. Tutkimustulosten perusteella, hyvinvointitiedon avulla voidaan luoda arvoa kansallisen hyvinvointitietovarrannon kautta tarjoamalla eri tahoille kehitysmahdollisuuksia helppokäyttöisen alustan kautta. Tämä alusta mahdollistaa arvon yhteisluonnin eri käyttäjien välillä, ja mahdollistamalla tuen kaupallisten toimijoiden toiminnalle.

Asiasanat: Hyvinvointidata, arvonluonti, hyvinvointitietovaranto, digitaalinen terveys, digitaalinen terveydenhuolto

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1 INTRODUCTION

As the world is going through a digital revolution, and whole industries have evolved through digital solutions, also the healthcare and well-being industries are growing rapidly. The amount of data is growing exponentially in the healthcare industry and will in 2020 exceed 2500 Exabyte (Accenture, 2018). The exponential growth of information related to personal health can be attributed to the advancement in sensor technology, and the development of smart devices, and in particular wearable devices. These devices incorporated with a multitude of sensors have made it possible for private individuals to use devices that gather data based on their lifestyle and activity, such as walked steps, heart rate and stress. These devices provide recommendations or suggestions on how to improve their life, which can be interpreted without having any healthcare related education (Gopinathan et al., 2018). Much of the data goes currently unused, as only a fraction of the gathered data is actually used (Hicks et al., 2019). To make use of the potential of well-being data, the data needs to be stored and refined into a form in which it generates value. A potential solution for storing well-being data are personal health records or PHR, that are used to store different types of health and well-being data in different forms (Tang et al., 2006). Well-being data gathered into a PHR provides the potential for studying the well-being of individuals and, to provide potential insights on the well-being of a whole society. These insights can then potentially provide solutions on how to enhance the well-being of individuals and of a whole nation.

The potential of well-being data and personal health records was understood by commercial technology companies in the early 2010s when Google and Microsoft launched their own respective commercial personal health record solutions for well-being data (Sunyaev et al., 2010). As time progressed, the endeavours proved to be difficult and unprofitable for even these large companies, and both services have since been terminated. Contrary to the commercial PHR's the Finnish Social Insurance Institution is undertaking a national project with the accordance of the Finnish Ministry of Social and Welfare, and the Institute for Health and Well-being to develop a personal

health record, the Kanta PHR. The record is intended as a database for Finnish citizens to upload their well-being data, with the aim to make it available for healthcare specialists, and to an extent commercial partners (Kela, 2020). The personal health record is intended to be free to use for all participants including users and application developers (Kela, 2020). As a downside for commercial partners, there are currently no direct financial benefits related to the project, as there are no financial constructs in place to compensate companies financially for their effort. This raises doubt on the motivation of commercial partners in joining the development project and provides a possibility to research value creation possibilities.

The definition of well-being data does not have an established definition in the scientific community. This owes to the fact that well-being itself is a multifaced term (Roscoe, 2009). This study will focus on the view of physical well-being, and data gathered from it. Well-being data can be also called as lifestyle data, which is defined as any measurement related to lifestyle risk factors such as physical activity and mental health (Gopinathan et al., 2018). This form of well-being data is selected as it is the most relevant form of well-being data considering this study. The research on well-being data itself is very limited and has thus be complemented with health-related data. The limited research on the type of well-being data relevant to this study and more specifically the value of it has focused on the healthcare sector, and potential the data brings to clinical care and selfcare (Frosch et al., 2012; Gao, Li, & Luo, 2015; Raghupathi & Raghupathi, 2014; Thompson et al., 2019). Literature on the data related to well-being has been studied through the devices capable of gathering well-being related data (Gao et al., 2015; Lane et al., 2011; Sannino, Forastiere, & Pietro, 2017; Zheng et al., 2013). The limitation of well-being specific value related research provides a research opportunity to study the value creation capabilities of well-being data. This allows research on not only in relation to value towards healthcare, and the benefits to overall health, but to understand the big picture of the value creation capabilities.

Personal health records can be defined as data repositories that store data related to the health and well-being of individuals (Tang et al., 2006). The existing research on personal health records has traditionally focused on the functionality, benefits and implementation into organizations (Personal Health Working Group & others, 2003; Pagliari, Detmer, & Singleton, 2007; Tang et al., 2006). The research shifted from the traditional viewpoint to more customer centric viewpoints and a focus on new technological solutions, and data security (Li et al., 2010, 2012; Sunyaev, 2013). Modern, and current research has focused on implementing new technological solutions to personal health records, and continued the study on data security (Beinke, Fitte, & Teuteberg, 2019; Braunstein, 2018). To the best knowledge of the author existing literature on personal health records lack extensive research on the establishment of a national PHR or the relation of the public and private sectors in such an effort. This research gap provides an opportunity to study the Kanta PHR project as it

is an existing development project initiated by the public sector with the intention to integrate private sector entities to the project.

The lack of existing research on the value creation of well-being data and of national PHR's provide an interesting research opportunity. The lack of research and the need to overcome obstacles by the Kanta PHR provide both theoretical and practical incentive for this study. The study will focus on researching the capabilities well-being data offers through the Kanta PHR, not only to the healthcare sector, but to other stakeholders as well. The research question for this study is the following: *How can well-being data create value through a national personal health record?*

The research seeks to answer the research question from the point of view of what is required for well-being data to create value through a national personal health record. The study seeks to find the constructs needed to facilitate value creation in the Kanta PHR. In this sense the research will not focus on value itself but provide answers how value can be created as perceived by the different stakeholders. The study will utilize literature on well-being data and personal health records to define their constructs relevant to the study. To formulate the empirical research on finding the elements needed for value creation, the study will use business models by Al-Debei, El-Haddadeh, & Avison, (2008) and business model dimension by Al-Debei & Avison, (2010). The business models provide an effective way to present value creation, as they discuss the different elements required for the value creation process.

This study will answer the research question in the form of a master's thesis. The study consists of a literature review, empirical research and of a discussion and conclusion section. The literature for this research was gathered by utilizing well known scientific databases relevant for the study: Google scholar, IEEE and ScienceDirect. These databases were used as they provide a large collection of relevant research material. The following words and their combinations were used to find relevant literature: well-being data, lifestyle data, personal health records, health data, ehealth, value creation, healthcare, big data, data commercialization, public sector, private sector, business model, wearable device.

The empirical research for this study was conducted with qualitative methods, and more specifically, as a single case study. The target case of this empirical study is the national personal health record developed by the Finnish Social Insurance Institution. The interviews conducted for the study were transcribed into written text from audio recordings, and analysed using the inductive analysis method.

This research is structured as followed, chapter 2 will discuss well-being data, determine it, and provide solutions on how the data is collected. Chapter 3 will discuss personal health records or PHR, define them and introduce existing types of PHR. Chapter 4 focuses on value creation and provides value creation logics, business models and business model dimensions to define elements required for value creation. Chapter 5 will summarize the literature review and provide a framework for the empirical research built upon the research literature. Chapter 6 will discuss provide the empirical research methodology

and the research process. Chapter 7 presents the results of the conducted interviews. Chapter 8 discusses the results presented in chapter 7 and reflects them on the presented literature. Additionally, chapter 8 discusses the conducted research, its validity, contributions, and future research subjects. Chapter 9 concludes the thesis by summarizing the study.

2 WELL-BEING DATA

With the advancement of affordable and compact sensory technology, and the growing interest towards personal health in the world, the amount of health-related data has grown exponentially and will keep doing so in the coming years (Accenture, 2018). These sensory devices are being used to collect personalized data from individual users. This data can be used to examine a person's well-being and to provide relevant information on the person's health. Well-being (or wellness) is often considered as a synonym to health and in the concept and research of well-being data, the term is intended as any data collected in relation to a person's or a group's health. To define well-being data for this thesis, a distinction between health and well-being data must be made.

To define well-being data this chapter will discuss the relationship of well-being and health and discuss different models and definitions of well-being in the first subchapter. The next subchapter will provide insights on different devices that are used to collect well-being data and provide examples on the mentioned devices. Finally, the chapter will be concluded by summarizing the information relevant for this study.

2.1 Defining well-being data

Well-being data is often described as ehealth because well-being itself is seen as a part of the definition of health. To define well-being data, well-being must first be distinguished from health. The World Health Organization or WHO defines health in its constitution as a state, where an individual is not only rid of disease or impairment, but of complete physical, mental and social well-being (WHO, 2006). This definition has been criticized, as health based on this definition is almost impossible to achieve by anyone. Sartorius, (2006) describes three possible and used definitions for health. Firstly, health is described as a state, where an individual is not affected with any disease or impairment. The second describes health as a state that does not hinder an

individual's ability to cope with daily life. The third definition describes health as a state that an individual has reached within himself after establishing stability, between himself and between his social and physical environment. Sartorius, (2006) recognizes that the three different definitions for health also have their own issues similar to the definition by WHO. argues that the issue with the first and second definition is the fact that individuals can feel completely healthy but are affected by abnormalities, that can be counted as symptoms of a disease or impairment, and thus not be healthy (Sartorius, 2006). The issue with the third description is that it requires a person to have an established balance with themselves, and with their surroundings (Sartorius, 2006). This means that those affected by a disease or impairment will be considered as being healthy to a certain point, defined by their individual capability in forming an internal balance, which makes them get the most out of their daily life, despite the existence of their disease or impairment (Sartorius, 2006). Ehealth is information related to healthcare in a digital form. The European Union, (2020) define ehealth as the tools and services of a healthcare system that use information and communication technology, which are used for disease prevention, diagnosing, care and for healthcare administration. The relation of well-being data and health data cannot be denied as well-being data can be seen as a part or a subcategory of health data. Well-being data lacks the quality of information that health data has, but makes up for the lack of quality with large quantity of information.

Well-being itself has many definitions and has been divided into multiple components by several theories. Roscoe, (2009) studied nine different wellness theories and recognized eight different components of wellness defined in the theories. The nine different components of wellness mentioned in the theory models found by Roscoe, (2009) are presented in Figure 1. The components of wellness found in the different research papers by the author are social, emotional, physical, intellectual, spiritual, psychological, occupational, and environmental. From the different dimensions the social, emotional, physical, intellectual, and spiritual are the most recognized dimensions. This thesis will focus on the physical dimension of wellness and use it as the definition of well-being as it is physical elements of an individual's well-being that are measured and gathered by wearable technology, stored in databases and which are relevant to this study. Physical wellness can be summarized as the active and continuing effort to maintain the optimum level of physical activity, focus on nutrition and additionally self-care, and maintaining of healthy lifestyle choices (Roscoe, 2009). Physical well-being data relevant for this study can also be defined as lifestyle data. Gopinathan et al., (2018) define lifestyle data as any measurement related to lifestyle risk factors such as physical activity and mental health such as quality of sleep, monitored chronic conditions such as blood glucose level and ability the ability to improve physical well-being.

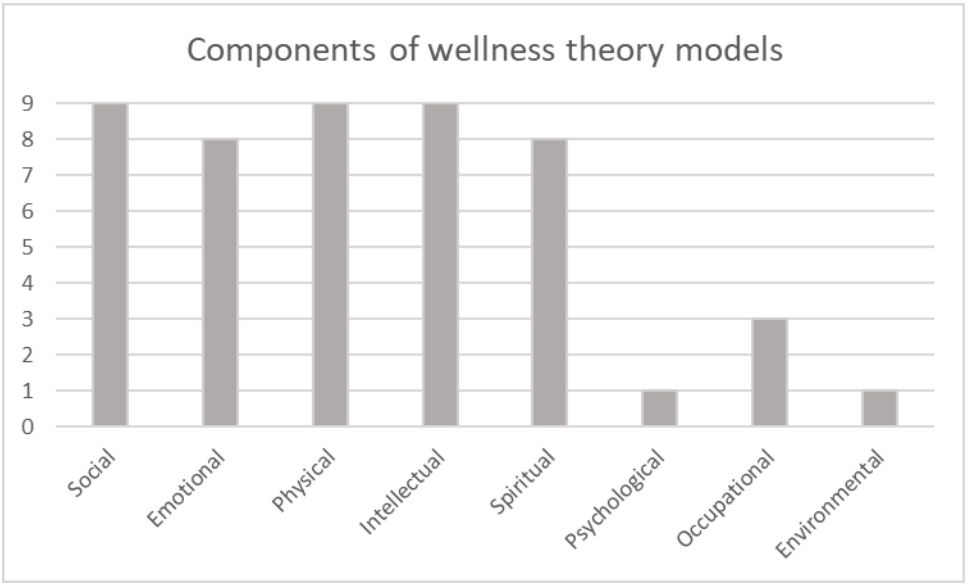

FIGURE 1 Components of different wellness theory models derived from (Roscoe, 2009)

Well-being data (also Wellness and Wellbeing data) itself is information collected by well-being devices and applications, which are tools for entering and processing a user's well-being data. Well-being data in this thesis is defined by the description of lifestyle data by Gopinathan et al., (2018) and the definition by Kela, (2020) as they encompass the necessary elements of well-being data relevant to this study. The Finnish Social Insurance Institution or Kela defines well-being data as information, which citizens have gathered and measured based on their lifestyle and activity that are directly or indirectly related to their well-being and promoting their health (Kela, 2020). Well-being data provides an opportunity to be used to complement health data (Raghupathi & Raghupathi, 2014). This comes from the fact that healthcare is mostly conducted reactively, which means that diseases and ailments are diagnosed and treated when they occur. Well-being data can be used to detect and diagnose diseases and ailments before they occur or in early stages, providing for more user-centered healthcare (Chen, Zdorova, & Nathan-Roberts, 2017). A definitive distinguishing can be made through the availability of the types of data. Data related specifically to a person's health can be considered more restricted from the viewpoint of data accessibility and gathering. Health data collection requires expensive devices which are usually located at medical institutions, such as hospitals and require educated personnel to be used and for the results to be interpreted. Well-being data on the other hand is usually gathered with semi affordable wearable consumer devices. The data gathered by these devices is not as accurate as the data gathered by clinical devices but combat that weakness with the amount they gather. The data gathered is easily interpretable by the user and does not require any medical training in doing so (Gopinathan et al., 2018).

2.2 Wearable devices

Well-being data as defined in 2.1 is gathered from users with different technological methods and more recently and often through wearable devices that use a variety of sensor technology for this purpose. The devices beneficial for this study can be divided into two categories, fitness wearables and medical wearable devices. Fitness wearables are used generally by healthy and active individuals that use the devices to measure different physical aspects or general well-being related to physical elements. Medical wearable devices are devices that are more generally used by elderly and less healthy users. The Medical devices are used to collect different aspects of an individual's health and are often designed for a specific disease or medical condition (Gao et al., 2015).

Related papers recognize three distinctive categories for wearable devices and complimentary applications. These devices are wearable computers, wearable electronics, and intelligent clothing (Malmivaara, 2009). These devices and applications linked to them are explored further in the following subchapters.

2.2.1 Wearable computers

Wearable computers are defined by Starner, (2002) as any computing device that is worn on the body by an individual. Malmivaara, (2009) defines wearable computers more specifically as a computer that is a device assembled in such a way that it is possible to be to be worn or carried on the body but still have a usable interface. Wearable computers most distinctive feature is the ability to be reconfigured to another task and the ability to run multiple programs simultaneously (Malmivaara, 2009). Modern examples for wearable computers are smart watches, which multiple manufacturers have brought to the market. Smart watches are used commonly as an extension of the smartphone to be used in messaging and phone calls, and more specifically as devices to for example monitor physical aspects, such as daily workout and heart rate (Seneviratne et al., 2017).

To compare wearable technology devices, two smart watches from the popular manufacturers Apple and Garmin were selected. The selected devices, the Apple Watch 5, and the Garmin Venu (FIGURE 2.) are both considered smart watches. The Apple Watch can be categorized as a smart watch with fitness capabilities, and the Venu as a fitness tracker with smart capabilities. Both of these devices can collect a wide variety of information related to the user's activity and health. These devices are also able to an extent process the gathered data and present it in such a form that the user can interpret the results (Apple, 2020 & Garmin, 2020). The selected devices like most of their contemporary equals are connected to smartphone applications through which the user can inspect the data gathered by the devices more in depth. The

Garmin Connect application works in sync with different Garmin wearable devices. The application provides detailed reports of the user's daily well-being data gathered, by an external device, analyses the gathered data and presents them in a visualized report, and is possible to connect to complementary applications which, for example provide nutritional information (Garmin, 2020). The Apple health application gathers data from the Apple watch and the iPhone -smartphone to provide the user with reports on fitness, sleep, nutrition, and overall health (Apple, 2020). The data types of the example devices can more specifically be seen in table 1. where they are compared to other wearable devices. As the spectrum of the data these watches combined with applications can gather is wide, only data types relevant to physical well-being were selected. This selection was done to make the process of comparing wearable computers to wearable electronics and smart clothing more relevant and accurate.

FIGURE 2 Garmin Venu (Garmin, 2020)

2.2.2 Wearable electronics

Wearable electronics are defined by Malmivaara, (2009) as simpler devices compared to full-scale wearable computers. Wearable electronics are generally constructed with set tasks to fulfil one or more need of a specific group and designed to be fundamentally worn on the body of the user and need to be worn on a body to function as intended. Ko et al., (2005) define wearable electronics as devices, which are constantly worn by the user unobstructive to provide intelligent assistance that augments memory, intellect, creativity, communication, and physical senses. Wearable electronics can be worn externally for example in the form of a ring, bracelet, or eyeglasses. Wearable electronics can also be used internally as implantable devices in the form of assisting devices such as neural implants and pacemakers (Malmivaara, 2009). As wearable electronics are limited to a specific task, the amount of different data they can gather depends heavily on the device itself. Smart bracelets provide an example for wearable as even though they are similar to smart watches, they are mostly focused only on health and fitness tracking (Seneviratne et al., 2017).

To compare wearable devices, two popular wearable electronic devices were selected, the Oura smart ring from Oura (FIGURE 3) and the Charge 3 bracelet from Fitbit. The Oura ring is intended for balancing one's well-being by gathering data related to the user's energy level, such as sleep (Oura, 2020). The Charge 3 from Fitbit is described as a fitness tracker that tracks the user's activity and well-being. The Charge 3 gathers a wide variety of data closely related to fitness smart watches but has limited smart capabilities and processing capabilities (Fitbit, 2020). Wearable electronics compared have limited processing and displaying capabilities when compared to wearable computers and often need a smartphone application to function to a full extent. The Oura application gathers the data tracked by the Oura ring and provides reports and suggestions to the user. The application provides information on sleep, heart rate, daily movement, and inactivity. In addition, the application provides the user with personalized activity goals, long-term trends, and optimal bedtime window and optimizes recovery (Oura, 2020). The Fitbit application works similarly to the Garmin Connect app as it gathers data from different Fitbit devices and provides visualized reports based on the data. The Fitbit application provides additional possibility to track calorie intake, but requires manual input (Fitbit, 2020).

FIGURE 3 The Oura ring (Oura, 2020)

2.2.3 Intelligent clothing

Intelligent clothing can be described as the most unobstructed category of wearable devices as they are intended to be even more "invisible" to users as wearable electronics. Malmivaara, (2009) defines clothing intelligent when something "unclothing like" is added to the garment without taking away any of its traditional characteristics. For example health monitoring capability are inserted into the clothing to function alongside the garment's traditional protective role. Tao, (2001) divide intelligent clothing into three subcategories: Passive smart textiles, active smart textiles, and very smart textiles. Passive textiles act only as sensors and only sense the environment. Active textiles can in addition to sensing react to stimuli from the environment. Very smart textiles can in addition to sensing and reacting, adapt to different conditions.

To compare intelligent clothing to other wearable devices, two types of apparel were selected, the Owlet Smart Sock and the Hexoskin Astroskin. The

Smart Sock from Owlet can be categorized as passive smart textile (FIGURE 4). The sock is an intelligent sock that is used to monitor a baby's heart rate and blood oxygen level. The sock sends the data to a connected application, which warns if the baby's condition changes below pre-set levels (Owlet, 2020). The Astroskin developed by Hexoskin is described as an " Ambulatory vital signs monitoring platform" and can be seen as intelligent clothing, as it is more or less a shirt implemented with different sensors, thus with the ability to gather a wide variety of data such as heart rate, blood oxygen and breathing from the user (Astroskin, 2020). As the devices mentioned in wearable electronics, also the intelligent clothing garments are highly depended on their computer or smartphone connected software through which the gathered data is visualized. The Owlet application is connected to the Smart Sock through which it tracks the blood pressure and oxygen levels of infants and notifies parents in case it tracks dangerous change (Owlet, 2020). The Hexoskin application functions as the visual interface for the Hexoskin shirt smart garment. The application provides the user with real time metrics measured by the shirt and allows the user to create pre-loaded workouts through which the application guides the user (Hexoskin, 2020). The devices combined with their application are presented with their datatypes in table 1.

FIGURE 4 Owlet Smart Sock (Owlet, 2020)

2.3 Conclusion of well-being data

Well-being itself has a wide range of aspects, but this study focuses on physical well-being as, the features of it are possible to be gathered and measured with technology (Gopinathan et al., 2018). Well-being data can be distinguished from health data by the definition of accessibility as it is gathered in much larger quantities, but provides a lower quality of information. Well-being data is information gathered from a person by different wearable devices that can for example be smart watches, rings, or smart garments (Seneviratne et al., 2017). The data these devices gather is often transmitted to well-being applications run on smartphones or computers. These applications are then used process the gathered data into a more presentable form, for example into visual reports

(Lane et al., 2011). The data gathered by wearable devices and processed by applications is not currently individualised for later use, but the potential of gathered specific individual data as a path to personalized healthcare is recognized (Chen et al., 2017). For well-being data to be used efficiently and be of value, the data needs to be stored in a place where vast amounts of sensitive information can be stored by users gathered by a multitude of devices and applications. A potential storage for large amounts of gathered well-being data are personal health records. These records gather personal well-being data and make it possible to be combine with health data. These records also make it possible to allow access to healthcare professionals to be used in clinical care.

TABLE 1 Summary of wearable devices and well-being applications with gathered data types

Device	Application	**Activity tracking**	**Heartrate**	**Blood Oxygen**	**Blood pressure**	**Stress**	**Sleep**	**Accel.**	**HR variability**	**HR recovery**
Apple Watch	Apple Health	x	x			x	x	x	x	
Garmin Venu	Garmin Connect	x	x	x		x	x	x		x
Oura Ring	Oura	x	x			x	x		x	
Fitbit Charge 3	Fitbit	x	x							
Owlet smart sock	Owlet App		x	x	x					
Astroskin	Hexoskin	x	x	x	x		x	x	x	

3 PERSONAL HEALTH RECORDS

This chapter will examine personal health records. The chapter will firstly define personal health records and examine their constructs. The personal health records will be examined from the view of architecture, functionality, finance, and stakeholders. The chapter will additionally provide real-world examples of personal health records.

3.1 PHR Construct

Personal health records or PHR in short, are defined by the Markle Foundation , (2003, p. 14) as*: "an electronic application through which individuals can access, manage and share their health information in a private, secure, and confidential environment."* Additionally, they can be defined as information repositories that include information which a person considers relevant to their health, well-being, development, and welfare, and over which the individual has primary control over (Tang et al., 2006) . The constructs of personal health records can be divided into four elements that can be used to examine how a PHR functions and which components are needed for it to serve its purpose. These four elements are architecture, functionality, finance, and stakeholders. Architecture describes the different architectural constructs a PHR has depending on its type of use. Functionality describes the actions the PHR can perform and for what purpose PHRs are built. Finance describes how personal health records are funded and how funding is distributed. Stakeholders describe the actors and other entities needed for a PHR to function as intended. These elements are discussed further in the following subchapters.

3.1.1 PHR Architecture

Different types of use cases or intentions on personal health records require different architectures. The architecture of a PHR depends on how the PHR is connected, how the data is integrated, what tools are available, how the data is stored, who the service provider is and what its primary source of data is. Reflecting on these requirements personal health records can be divided into three categories based on their architecture, local or standalone, cloud or connected, and hybrid (Archer et al., 2011; Steele, Min, & Lo, 2012).

Local or standalone personal health records are classified as standalone PHRs as they are not connected to other systems and do not require an internet connection to operate (Steele et al., 2012). On local PHRs the data integration usually depends on the patient or user of the PHR who is required to input the data manually into the database (Tang et al., 2006). The tools used to create and maintain the local PHR can also be classified as standalone tools as the PHR is not connected to any other systems (Steele et al., 2012). These tools depend on the type of storage device used to store the data. As a local PHR can be as simple as a spreadsheet on a USB-device or a mobile phone, the interface can be quite unsophisticated (Detmer et al., 2008). The service provider of local PHRs can vary, the PHR can be a local file created by the user themselves, a provider-based PHR offered by healthcare providers, a payer-based PHR offered by health insurance companies or a commercial PHR created and maintained by commercial technology companies (Steele et al., 2012). The data source of a PHR can be linked to the service provider, but it can also vary depending on its constructs. As a local PHR is not usually connected to other systems, it can be classified by its primary source of data as an interoperable PHR. This means that the PHR has a centralized system for managing, collecting, and sharing data (Steele et al., 2012). The standalone personal health record is depicted in FIGURE 5 as described by Steele et al., (2012).

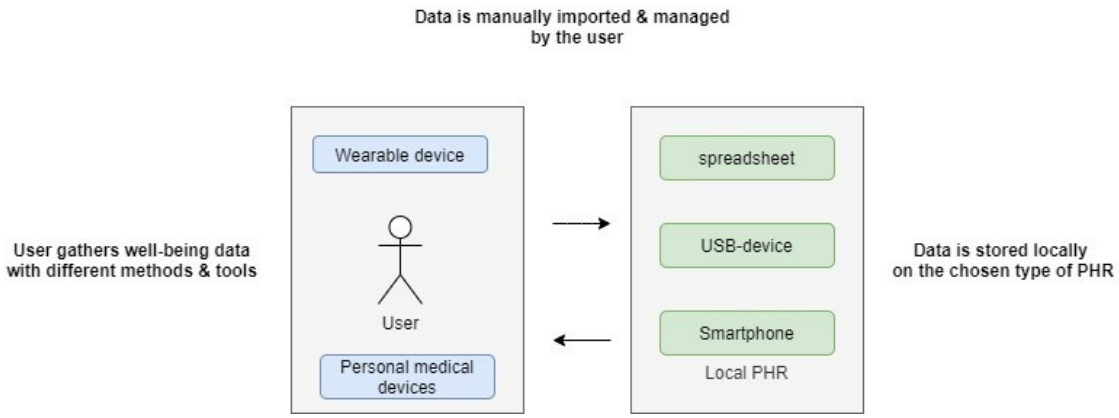

FIGURE 5 Standalone personal health record

Web or cloud based PHRs function differently to standalone and unconnected PHRs. Web based PHRs are interconnected or tethered systems that can be connected to various different healthcare systems or if tethered integrated with a healthcare providers electronic health record (Detmer et al., 2008; Steele et al., 2012). Depending on the organisational settings a web or cloud based PHR usually has intermediary data integration where the data is collected, stored, and operated on a third-party data storage, which is connected to the PHR (Steele et al., 2012). Alternatively, the PHR can use integrated health systems where data is collected from various sectors of healthcare and gathered to a single place of access (Detmer et al., 2008). Web and cloud based PHRs are used typically through a secure internet access which allows access to data which is maintained and owned for example by a healthcare providing organisation (Steele et al., 2012). On these PHRs the storage type of data usually varies between being centralized, decentralized or peer to peer. If centralized the data is stored to a single database which houses all information available to an individual. In a decentralized data housing method, the PHRs data is stored to different databases which all need to be connected for the data to be retrieved (Steele et al., 2012). In a peer-to-peer based data storage the user of the PHR needs to create and manage different data streams that are connected to the PHR and to different systems containing the user's data (Steele et al., 2012). The service provider for a cloud or web PHR as for a local PHR can vary between being provider based, payer based or commercial. In a provider tethered form, the PHR is tethered to the healthcare provider's information systems and gains access to data through the PHR. The payer tethered PHR is tethered to the information systems of the healthcare payer (Shah et al., 2008). In the third party PHR the PHR is provided by organizations not related to healthcare for example in the form of technology companies. In the form of an interoperable PHR the system has centralized functions (Steele et al., 2012). The remote PHR is the most common version of PHR architecture currently used as it provides the most robust and diverse methods for use (Steele et al., 2012). The web based personal health record is depicted in FIGURE 6, as described by Steele et al., (2012).

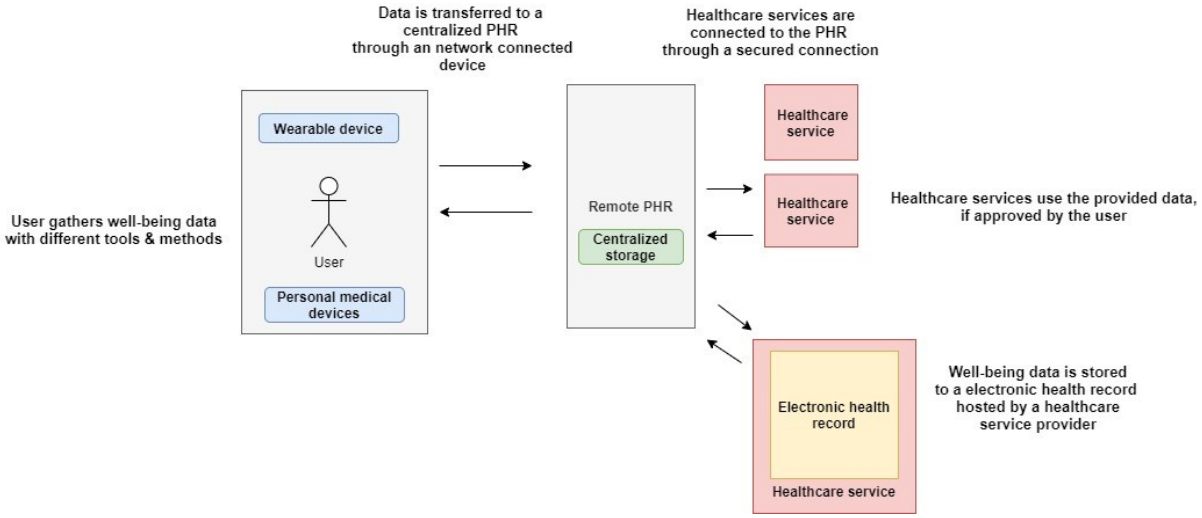

FIGURE 6 The web-connected personal health record

A third architectural alternative to the local and web-connected PHRs is recognized by Steele et al., (2012), the hybrid PHR. The hybrid model of PHR that is a combination of a local and web-connected PHR that can both be locally stored and connected to different systems (Tang et al., 2006). This makes it possible for the data to be duplicated to be stored locally and on various systems. This makes the PHR able to withstand different vulnerabilities that could affect the other types of PHR (Steele et al., 2012). The hybrid PHR as described by Steele et al., (2012) is depicted in FIGURE 7.

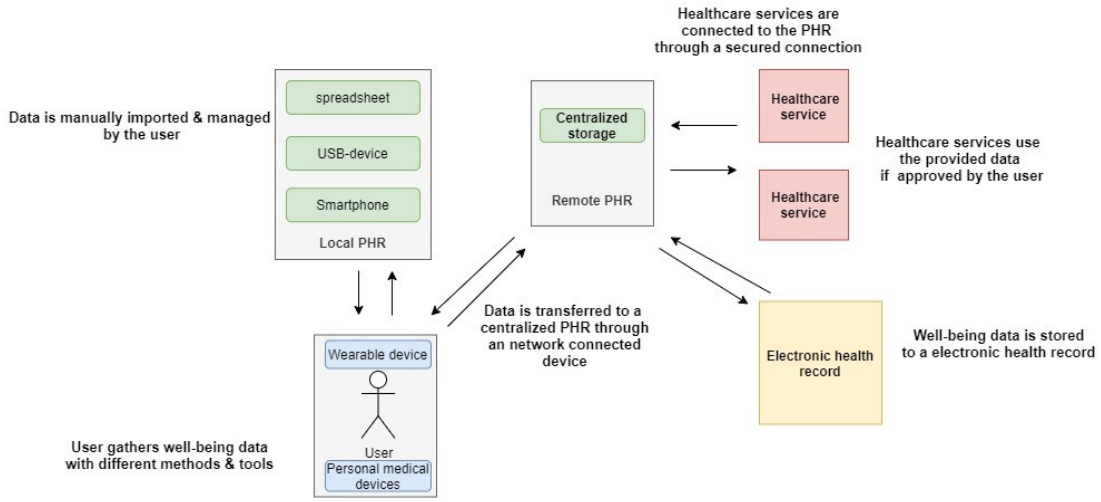

FIGURE 7 Hybrid personal health record

The architecture of the PHR not only affects the environment it is used in but also has an impact on the functionality, finance, and stakeholders of a PHR, which are discussed further below.

3.1.2 PHR Functionality

A PHR's main purpose is to provide a platform for information storage to support healthcare functions and the well-being of an individual. As a result a PHR's functionality can be divided into three different sectors, information collection, information sharing and exchange, and information self-management (Archer et al., 2011; Kaelber et al., 2008).

Information collection refers to the process of gathering information related to a person's well-being and health, which is usually measured by a variety of devices and software and lastly stored in the PHR (Kaelber et al., 2008). The information can also be gathered manually by the operator or user of the PHR or a person linked to the PHR of an individual, for example by a physician. The information collection methods of a PHR vary on the architecture of the system which regulates how the PHR is connected and operated (Detmer et al., 2008). The information collection allows the recording of diet, exercise, symptoms, questions and other health or well-being related information. This stored data can then be shared to other entities if needed (Health & Services, 2010).

Information sharing and exchange comes in the form of providing information stored to the PHR to different stakeholders. The information can be shared to a doctor caring for a patient, to different healthcare providers so that information is kept up to date and to insurance companies (Kaelber et al., 2008). Information exchange is intended for the PHR to exchange data with a patient / user and the organizations, or persons related to the patients care. Sharing allows for the information to be given out in one way, for example a patient / user of the PHR can share their information to a selected service provider (Kaelber et al., 2008). Information exchange allows for two-way transferring of information in the sense that the user of the PHR can select to share their information and then also receive new information for example in the form of self-management (Kaelber et al., 2008).

The information self-management functionality allows for the user of the PHR to store, track and modify information that has been gathered from their well-being and health by healthcare officials or by themselves (Kaelber et al., 2008). The self-management functionality makes it also possible for the patient to receive information on different diseases, decision support or even suggestions on how to improve their health. Self-management allows for the user of the PHR to receive reminders for different appointments or treatments through the system (Kaelber et al., 2008). The system can for example remind the user of a pending vaccination when it is due. The decision support through the PHR can come in the form of lifestyle support, medication support or diagnosis education support (Archer et al., 2011). These decisions support the well-being and health of a patient or user of the PHR.

3.1.3 PHR Finance

Personal health record finances are strongly tied to the organisation that provides the service or manages the PHR. Depending if the PHR is provided by a public organisation the PHR is then usually also managed by public funds with the intention to make other expenses smaller through the implementation of a PHR. The public intent of financing of a PHR can be directed to the bigger picture of lowering the overall costs of public healthcare, as the PHR provides additional information for clinicians and provides citizens a tool to better monitor their own well-being (Raghupathi & Raghupathi, 2014; Tang et al., 2006). Private organisations have the possibility to sell the PHR as a service to healthcare providers who then use the privately created platform to provide services to their customers (Sunyaev et al., 2010). It is also possible that the PHR is managed by a health insurer, who through the creation of the PHR gather information related to a person's health insurance and provide it as an additional service (Steele et al., 2012). The PHR can also be financed by a company that uses the data in the PHR and sells it to organizations which use the data for research purposes or for example insurance companies (Sunyaev et al., 2010). The provider of the PHR needs to be taken into consideration when the financial constructs are discussed. A commercial provider of the PHR seeks to make a profit from the PHR versus the public provider who does not seek direct financial gains in mind. Commercial providers may face different governmental and regional regulations regarding data commercialization (Hunter, 2016). On the other hand, the commercial PHR provider may have an already developed concept which can be taken into use fairly quickly versus the public provider who usually has to start the project from nothing.

When considering the finances and costs of a PHR, one has to take into consideration development and annual costs. Development and annual costs consist of infrastructure and application costs (Shah et al., 2008). Development costs are expenses that need to be considered when the PHR is being developed and taken into use. Infrastructure costs take into consideration all of the functions that allow a person to manage their information in the PHR. The infrastructure allows the operation of the PHR by multiple users and for the data to be gathered from multiple data sources. Application costs are costs that accumulate depending on all the different functions a PHR has which allows its users to monitor, manage and learn about their own and others well-being and health (Shah et al., 2008). The applications make two-way data exchange possible and allows transactions with others regarding health and well-being related information (Shah et al., 2008). The development costs depend also on the architecture of the PHR. A standalone PHR can be considered as the simplest version as it can only be information stored locally in one place. This makes it also less expensive than a connected or hybrid PHR that usually have a wider range of applications and connections, and more users (Shah et al., 2008).

Annual costs for a PHR consist of cost that accumulate from the operation of a PHR annually. The annual costs include maintenance, user support, storage

hosting and software licence fees (Shah et al., 2008). As for the costs in the development phase, the annual costs of a PHR depend on the architecture. A smaller number of users, applications and functionalities cost less to maintain than a larger user base with a wide variety of functionalities.

3.1.4 PHR Stakeholders

Depending on the type and architecture of a PHR, a wide variety of stakeholders are needed for the PHR to function properly. PHR related literature recognizes four categories of stakeholders for a PHR: Users and relatives, healthcare professionals, service providers, government officials (Beinke et al., 2019; Tang et al., 2006).

Users of a PHR refers to the persons that have their personal health information stored into a PHR. As the PHR can have a wide variety of data including health related information to activity and exercise related information the professionals making use of the data also need to have a wide variety of expertise. Healthcare professionals in the PHR context refers to medical services and commercial health organisations. The professionals using PHRs does not only directly mean clinicians and care individuals, but also for example dietician or a physical therapist (Beinke et al., 2019).

Service providers are also included as key stakeholders of a PHR. Service providers include the developer and operator of the PHR itself and the application developers who create services and applications connected to the PHR. The Service provider can be a governmental entity, public healthcare provider or a commercial organisation (Tang et al., 2006). Application developers provide the variety of applications needed to upload different types of data in the PHR and applications that make possible for the user refine the data stored in the PHR.

Government regulators are related to the PHR as they regulate the usage of the data stored into the PHR. As a PHR stores a variety of private information of individuals, it can be seen as important that the use of data is regulated and supervised by a higher authority (Tang et al., 2006). Regulators make sure that the PHR meets data safety standards, regulates who can access stored data and regulates where and how the data can be used (Beinke et al., 2019).

3.1.5 Existing versions of PHR

To examine existing versions of PHR, three services will be introduced in this chapter. The first one to be examined is the project is the Kanta PHR which is and national effort to develop a PHR to be used in the Finnish healthcare. The second service is the already ceased project of Microsoft HealthVault, which was a commercial PHR effort. The third service to be introduced is the Lydia by Get Real Health, which is a commercial PHR solution.

The Kanta PHR is a national data repository developed by the Finnish Social Insurance Institution and the Finnish Institute for Health and Welfare. The PHR is intended to make it possible for citizens to enter information related to their health and well-being into a safe location. The data will be in the future available for sharing with healthcare services if the user so chooses (Kela, 2020). Citizens can import well-being and health related information that has been gathered by well-being applications or devices into the PHR. These applications and devices have been approved by the Kanta development team to provide for secure operation. The data stored in the PHR can range from health-related data, such as blood glucose level information to activity measures, such as the number of steps travelled. Additionally, the service makes it possible to store individual care plans and symptom evaluations (Kela, 2020). The PHR is connected to the My Kanta service, which serves as the access portal for citizens to monitor their health information on a national platform (Kela, 2020). The development is financed by the Ministry of Social Affairs and Health, and the use of the PHR is free of charge to citizens. Currently also the process of connecting an application to the PHR is free of charge for application developers (Kela, 2020).

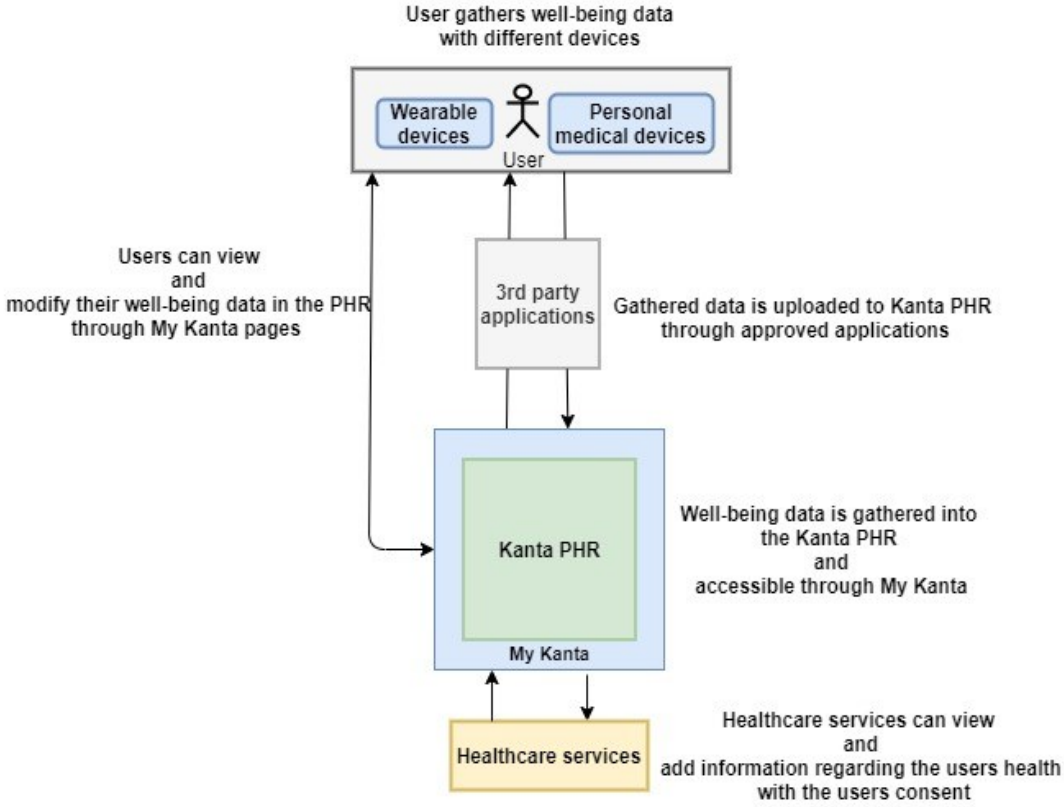

FIGURE 8 The Kanta PHR

The HealthVault was a web based PHR developed by the technology company Microsoft. The PHR was active from 2007 until November 2019, when Microsoft announced that it would shut down the service and delete the data

stored there (Engadget, 2020). HealthVault made it possible for private individuals to store information related to their health and well-being, which they could then share to healthcare professionals. The PHR was accessed through the HealthVault application or website which made it possible for individuals to access their personal information and additionally for example their child's information. The HealthVault could be connected to different health and well-being related devices such as heartrate monitors and fitness watches, and receive the data gathered by these devices (Sunyaev, 2013). The HealthVault was free to use by individuals but charged a fee from organizations and had adverts in its search engine. Microsoft, the developer, and operator of HealthVault announced in 2019 that the service would cease operations on the 20th of November the same year. Microsoft did not give reason for shutting the service down, but it has been speculated that the cancelation was cause of low levels of adoption, focus on traditional health records over dynamic ones, limited availability of connections with wearables and no proper mobile operation (HIT Consultant, 2019). Microsoft informed that users that the collected data will be deleted from HealthVault and that they can choose to migrate their information to another commercial PHR Lydia (HIT Consultant, 2019).

Lydia is a commercial PHR developed by health technology company Get Real Health. Lydia combines health data with well-being data that users gather with a variety of fitness or other devices and then upload on to the platform (Get Real Health, 2020). The agenda of the developer Get Real Health is to combine data from patients that come from well-being devices and applications and combine this with clinical data. The well-being data and clinical data is combined to provide individuals and professionals with insights based on this (Get Real Health, 2020). Compared to the HealthVault, Lydia has a larger ecosystem of connected devices and a more modern user interface. Emphasising on personal data control, the platform provides users with a single access point for data management and interaction (Businesswire, 2019).

3.2 Conclusion of personal health records

Personal health records are a set of data gathered from an individual's health or aspects of physical well-being such as exercise activity or blood pressure. and stored in an accessible and secure place. This data can be stored, viewed and modified by the person whose data is stored in the database or by a healthcare professional, depending on the type of the PHR. Personal health records can be shared into three different versions depending on architecture: local, connected and a hybrid model (Steele et al., 2012). A personal health records functions are limited by its architecture. The functionalities of a PHR can be classified in three categories: information collection, information sharing and exchange, and information self-management (Kaelber et al., 2008). The functionalities of a PHR affect the way that the system can operate with different stakeholders. Personal

health records can have a multitude of stakeholders, but the most recognized are users, healthcare providers, application developers, auxiliary services, and government regulators. Providers of personal health records can be roughly divided into three: Public operators, commercial operators, and a combination of the prementioned (Tang et al., 2006).

Examples of personal health records include the currently under development Finnish national Kanta PHR, the already ceased Microsoft HealthVault and Lydia, a commercial PHR solution. The Kanta PHR is a national effort to construct a PHR that combines personal well-being data gathered by 3rd party applications with health data to provide more effective healthcare (Kela, 2020). Microsoft HealthVault was a commercial PHR which combined well-being data gathered by users with their health data and made it available for medical professionals and researchers (Sunyaev, 2013). Lydia, a commercial PHR developed by Get Real Health, which gathers individual well-being data with medical records to provide a more comprehensive picture of an individual's health and provide the information to healthcare professionals and other related authorities (Get Real Health, 2020).

The functional idea of personal health records is to provide a location for data gathered by an individual about their health and well-being. This data can then be used as complimentary data to health data that is gathered in clinical situations to get a more comprehensive picture of an individual's health (Tang et al., 2006). The reasoning behind the use of personal health records can be traced to the idea of reducing healthcare costs as individuals become more aware of their own health and the individual scope becomes clearer. The way that a PHR can achieve its goal and provide value is not yet clear as the concept of a PHR and the data it uses cannot be determined by a single concept of value creation in the private sector or existing value creation concepts for the public sector. As personal health records operate both in the commercial and public domain, the value creation construct for the records needs to be assessed.

4 VALUE CREATION

The aim of this research is to understand value creation in a certain context. To examine different value creation methods, this chapter will study value creation and examine how they can be combined in an industry that is a mix of the public and private sectors. After defining value creation, the chapter will define the business model and examine business model dimension. Finally, the chapter will discuss business models for data centered organizations.

4.1 Defining value creation

Value can be seen as an ambiguous term and often depends on the context it is referred to in and to which scenario it is applied to (Vargo, Maglio, & Akaka, 2008). This subchapter will define value for this research through value creation by studying two value creation processes, the goods-dominant and service-dominant logics. The goods-dominant logic is viewed as the classical view on value creation and is referred to as value in exchange (Vargo & Lusch, 2004). The service-dominant logic is a more modern approach on value creation which is referred to as value in use (Vargo & Lusch, 2004, 2008).

4.1.1 Goods-dominant logic

The goods dominant logic can be seen as the classical view on value creation where the value is created by a manufacturer and transferred to a customer. The traditional view of value creation implies that an offering is of value only of when it is exchangeable to something in the sense of value in exchange (Verma et al., 2012). This also implies that the manufacturer's role in the value creation process ends when the exchangeable object changes ownership in the process of a transaction with a customer for example against money. It is also argued that the product that is the focus of the value is utilized in another location than

where it is originally created, and the fact is considered as a secondary importance (Verma et al., 2012). The perspective where the equipment manufacturer sees the unit of production as inherently valuable even before its use is referred often as goods dominant logic (Vargo & Lusch, 2004 &Verma et al., 2012). The goods-dominant-logic derives from the long history of political economy where goods were produced and exported to create value for a country (Vargo & Lusch, 2004). This has led to the dominant view as value in exchange and has driven the growth of such value for business growth and competitive advantage (Verma et al., 2012).

The purpose of value in the goods-dominant logic is to increase the value of the firm producing the goods and the value is measured through the price received form the exchange of the mentioned goods (Vargo & Lusch, 2004). The goods dominant logic focuses on operand and tangible resources in which value is embedded during the manufacturing process of goods or services by increasing attributes. This creates the role for the firms to be the ones that produce and distribute the value to customers. These customers then use and destroy the value through the exchange process (Vargo & Lusch, 2008).

4.1.2 Service-dominant logic

As an alternative for the traditional goods-dominant logic, the service-dominant logic was developed. The service-dominant logic provides an alternative view on how value is created by providing two new perspectives in the form of value in use and value co-creation (Vargo & Lusch, 2004). In the service-dominant logic the value is created not only by a firm creating goods but also customers and partners of the firm (Vargo & Lusch, 2004). The purpose of value is argued by Vargo et al.,(2008) to increase the ability of adaption and survivability through applied knowledge and skills of others. As a consequence, the value is measured through the adaptability and survivability of the system. Compared to the goods-dominant logic which is built upon operand and tangible resources the service-dominant logic focuses on operant and intangible resources (Vargo & Lusch, 2004). In contrast to the resources and products in the goods-dominant logic, the resources of the service-dominant logic are more invisible and derived for example out of knowledge (Alves, Ferreira, & Fernandes, 2016).

As mentioned, in the service-dominant logic the value is not only created by the company, but also other stakeholders. This means that the firm's role is not only to produce and distribute value but instead propose and co-create value and to provide the services which make value co-creation possible. This leads to the role of the customer who are seen as the users of the value in the goods-dominant logic change to a co-creator of value who uses the resources provided by the firm to complete the process (Vargo et al., 2008). The role changes of the resources, firms and customers also affect the role of goods, which move from being units of output embedded with value to vehicles of

operant resources that enable access to the firms competences (Vargo et al., 2008).

In the value-in-use description of value used to define the service-dominant logic the roles of the producers and consumers of value are faded. This means that value is co-created together during interactions of providers and beneficiaries in which resources and competences are integrated (Vargo & Lusch, 2008).

4.1.3 Combining the goods-dominant and service-dominant logics

To inspect a combination of varying value creation logics, this thesis will examine the goods-dominant and service-dominant logics in the context of healthcare. The healthcare sector is a good example of a field to which both the goods-dominant and service-dominant logics are applied. The healthcare sector has both implications of value creation by a provider or manufacturer and of value co-creation. Contrary to the private sector, the value creation methods in the public sector cannot be as easily divided into the goods and service dominant logics. Healthcare however makes an exception, as it can be viewed from both the public and private sector viewpoints. Healthcare incorporates actors and entities from both sectors, and as such use a set of value creation logics from both.

Goods-dominant logic in healthcare can be seen through nouns, as in medical devices, hospitals, electronic health records and laboratory tests (Joiner & Lusch, 2016). The logic looks at the value creation process from the patient-provider point of view. The patient-provider view sees the patient as the customer and the cure or treatments as the goods which are created by the providers of healthcare. The provider acts as the creator of value in the sense that they provide patients with medication or care that is then consumed by the patient or customer, after which the relationship ends. In the goods-dominant logic the provider of value is seen by the patient as an experienced, innovative, and creative source and creator of value. Patient is seen as inexperienced, passive and as one who consumes and uses the up provided value (Frosch et al., 2012). This view represents the separation of the patient and provider in the value creation process.

To move the primary focus of healthcare from the delivery of goods, the service-dominant logic is implemented. The service-dominant logic in healthcare can be seen through verbs, as in healing, monitoring, and curing (Joiner & Lusch, 2016). The service-dominant logic sees the patient and provider as creating, sensing, and learning. They co-create value through concepts patient engagement and activation, and through measurements as life expectancy and vaccination rates. The service-dominant logic reflects the patients their own knowledge, skill, ability and willingness to manage their own health (Joiner & Lusch, 2016). The service-dominant logic focuses on

patient-centered care, where focus is put on the providers and system to improve the consumer's capabilities of achieve their intended job and induce self-efficacy (Joiner & Lusch, 2016).

The applicability of these value creation methods to both the private and public sectors is important as the object of this study is linked to both sectors. To inspect value creation more specifically in a certain context, the value creation process can be developed through business models. These business models explain and showcase the different elements an organisation has and needs to create value.

4.2 Business model dimensions

For value to be created, an organization needs a model of what aspects it needs to take into consideration if they seek to create value. An effective way to present an organizations value creation capability are business models. To support the research of the value creation capabilities of well-being data, this chapter will define the business model concept and examine four dimensions of a business model recognized in the business model concept. After defining the theoretical background for the business model, this chapter will discuss different business models for data commercialization, as a way to showcase possible value creation methods for data and data specific organizations.

To define digital business models, the business model (BM) concept needs to be defined. Timmers, (1998) Defines the BM as an architecture for products, services and information flows that include a description of various business actors and their roles. He also describes the BM as a description of potential benefits for various business actors and sources of revenues. Petrovic et al., (2001) define business model as a description of the logic that describes a business system for creating value existing under actual business processes. Kallio et al., (2006) describe BM as the means through which a firm is able to create value by coordinating the flow of goods, information and services among the various industry participants it comes in contact with including customers, partners within the value chain, competitors and government. Osterwalder et al., (2005) define BM as a conceptual tool which contains elements and relationships of the value a company offers customers, the architecture and network of partners for creating value. Al-Debei et al., (2008) studied 17 different definitions of business models to define the BM in the world of digital business. They argued that as proven by the vast amount of definitions they found and studied, there is no singular or clear definition of the business model concept. Al-Debei et al., (2008, p. 8) define the BM as: *" an abstract representation of an organization either conceptual, textual and / or graphical, of all core interrelated architectural, co-operational and financial arrangements designed and developed by an organization presently and in the future, as well as all core products and/ or services the*

organization offers, or will offer, based on these arrangements that are needed to achieve its strategic goals and objectives."

As a continuum to the complete definition of the BM concept. Al-Debei et al., (2008) developed a unified framework for the business model concept. To draft the framework, they seek to answer four questions. Firstly, they needed to understand the different elements and dimensions of the BM concept. Secondly, they needed to understand the modelling principles of BMs to see what guidelines organizations need when modelling their BM. Third question they needed to understand the reach of the BM concept as to how position the BM within different organizations. Lastly, they needed to answer regarded the reach of the BM concept in a rational and practical role to understand why the BM is significant to companies and why they should care about it. As a resolution to these questions the authors found four business model dimensions, (FIGURE 9). These dimensions describe the different approaches to BM structure. The four BM dimensions found are: Value Proposition, Value Architecture, Value Finance and Value Network. These four dimensions also contain different value elements through which the dimension is constructed.

4.2.1 Value proposition

The value proposition dimension describes the offering value structure of an organization. The value proposition dimension of the business model is based on the view that BM describes the way an organization creates value (Al-Debei & Avison, 2010). The value proposition is described in two ways; 1. The way in which an organization and its business partners create value for their customers. 2. The way in which an organization and all its stakeholders create value for every involved party. Based on these views Al-Debei & Avison, (2010) suggest that this implies different elements for the dimension. The first element suggests that a BM should include a description of the offerings a digital organization provides or will provide along with relative information. The second element needed is the intended value element with the third being the description of the nature of the targeted market segments with their preferences. Kazan et al., (2013) applied the framework provided by Al-Debei & Avison, (2010) to their study of cryptocurrencies and described the value proposition as the value creation logic. This logic describes the core activities of a digital organization while offering its products and services. Value creation in the value network class perform efficient mediation among different stakeholders' firms in the value. Value proposition can be briefly described as the way that demonstrates the organizations business logic of creating value for customers and / or to each party involved through offering products and services that satisfy the needs of their target segment. For example, the company creates value for customers analysing and creating insights on their daily activity. The value proposition thought in the idea of value creation logic makes the framework more versatile as it can be applied to different empirical settings, such as healthcare and well-being data.

For the value proposition to provide value as intended, it needs a structure through which the value creation process is supported. This support structure can be described by the value architecture dimension.

4.2.2 Value architecture

The value architecture dimension describes the technological architecture and organizational infrastructure of the organization using the BM (Al-Debei & Avison, 2010). The elements included in the dimension are the core resources, value configuration and core competency of the organization using the BM. The value architecture dimension is derived from the resource-based view which views all organizations as a bundle of resources. In this context the resource-based view emphasizes the strategic importance of resources that are effectively combined with the generation of desirable value by customers and as a outcome generates a sustainable and competitive advantage to the company owing the resources (Al-Debei & Avison, 2010). From this it is argued by Hedman & Kalling, (2003) that for any organization wanting to succeed on the market, it needs resources and inputs that can be modelled into physical, human or organizational form. It is also argued that the resources need to be organized and configured properly so that they create an effective value proposition. Hedman & Kalling, (2003) argue that the economic value of a digital business is determined by its ability to absorb ICT resources and align them with existing resources effectively. Based on this view Al-Debei & Avison, (2010) argue that the BM needs the representation of an organization's resources, configuration and effective core competencies.

Value architecture can also be described as the value delivery architecture. The value delivery architecture is a view derived from value architecture and describes the difficultly replicable capabilities and resource configurations of an organizations. It represents the architectural boundary and means how digital organizations deliver value (Yoo, Henfridsson, & Lyytinen, 2010). A common representation of value delivery architecture are digital platforms. Digital platforms are generally described either from a technical perspective or a sociotechnical perspective (de Reuver, Sørensen, & Basole, 2018). In a purely technological context digital platforms are described by Tiwana et al., (2010) as an extensible codebase that provides a core that is shared by the modules that interoperate in the platform and provides the interface through which they interoperate. According to de Reuver et al., (2018) digital platform can also be described as a sociotechnical assemblage which encompasses technical elements of a platform and the associated organisational processes, and Yoo et al., (2010) describe digital platforms as layered modular technology architectures in business networks. These business networks make it possible for platforms to orchestrate technological components to foster co-innovation with cooperative stakeholders, who might also be competitors among themselves. In addition, platforms can also be house competitors within the same platform stack (e.g. Amazon and Apple). Ghazawneh & Henfridsson, (2013) build on the definition

of Tilson et al., (2012) and define digital platforms as platforms consisting of the extensible codebase of a software-based system that provides core functionality shared by the modules that interoperate with the platform and the interfaces through which the modules interoperate.

4.2.3 Value network

The value network dimension describes the business and customer actors' web of the organization. It can be described as a way in which an organization enables transactions through coordination and collaboration among parties and multiple companies. The element depicts the inter-organization perspective, it has been described as a way in which transactions are enabled through the coordination and collaboration among parties, multiple companies, and stakeholders. The dimension is constructed from seven elements: actor, role, relationship, flow-communication, channel, governance, and network mode. Based on this point of view the business model describes the value system of an organization and its relationship with different stakeholders (Al-Debei & Avison, 2010). Through this it is indicated if the value network is open as in anyone can suggest or provide ideas or closed in the sense as in only selected actors can suggest or provide ideas (Pisano & Verganti, 2008). This viewpoint also depicts the business model to demonstrate different roles of the actors within the organization and shows explicitly how value is exchanged, flowed, and communicated among stakeholders. Additionally, it can be used to explain which actors are governing or dominant in the business network.

The term actor has been deployed to depict different roles within the value network. As its basic function the term has been used to depict different business organizational actors those involved in the main functions that relate for example to value creation and marketing (Rajala & Westerlund, 2007). In a wide sense this term has also been used to include competitors and public organizations such as governmental agencies. Based on this all the mentioned actors are organizations and as such can be presented as organizational actors. However, the value network also includes the customers of the organization as well and should as such be considered as a multi-party stakeholder network (Rajala & Westerlund, 2007; Timmers, 1998).

Kazan et al., (2013) described the value network as the value stakeholder network. The value stakeholder network presents a system based on interim modularity where various firms in interconnected networks contribute and mediate configured resources and modules to derive value in an orchestrated manner. As example, for this can be taken food delivery services that work through smartphone applications different restaurants share a platform to distribute value to customers and the platform needs different providers to provide value themselves.

For the value network dimension to work in accordance with other value creation elements, the financial constructs on how these stakeholders function

need to be determined. These constructs can be viewed through the value finance dimension.

4.2.4 Value finance

The value finance dimension describes the financial setups and returns of an organization. It can be described as the way in which organizations manage issues related to costing, pricing and revenue breakdown to sustain and improve its creation revenue (Al-Debei & Avison, 2010). The business model is strongly connected to the economic and financial designs of an organization. Whenever the concept is used, many people assume that financial arrangements are addressed in respect to revenue generation. Value capturing mechanisms term provides an additional method to describe value finance. Value capturing mechanisms describe the logic of digital organization in how it extracts value from its value creation. Al-Debei & Avison, (2010) describe the value finance having three elements: total cost of ownership, pricing method and revenue structure. As example for the value finance dimension can be described as the monthly subscription based pricing method they have for their digital service and additionally if they have advertising, it can be added together with the monthly subscriptions to act as the revenue structure of the organization.

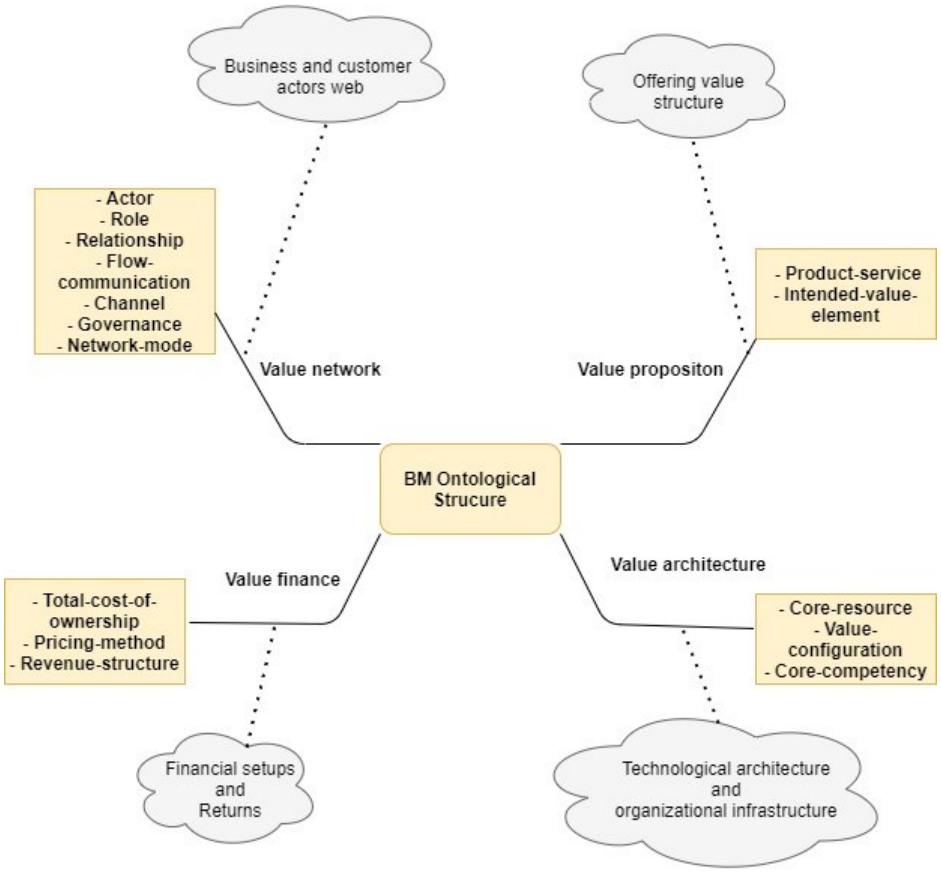

FIGURE 9 Ontological structure of the BM, (Al-Debei & Fitzgerald, 2010)

4.3 Business models for data centered organizations

As business models can be used to present an organizations value creation capabilities, the research on business models of data can be used to provide information on how value can be created with data. These business models are provided to support the understanding of how data centered organizations create value. This is relevant regarding this study as it seeks to understand how well-being data creates value. Thomas & Leiponen, (2016) recognized six different business models for data ecosystems from the research paper made by Pigni et al., (2016). Data ecosystems can be described as an innovation ecosystem where members are technologically interdependent and value co-creation is done through existing data business models (Thomas & Leiponen, 2016). The six recognized business models are data suppliers, application developers, service providers, data aggregators, data managers and data custodians (Thomas & Leiponen, 2016). The chapter will additionally discuss existing business models for well-being data, and briefly discusses the challenges data commercialization faces.

4.3.1 Data suppliers

Data suppliers are organizations or entities that provide data in a way that other organizations or individuals can use this data. The data supplied by these suppliers is usually raw and undifferentiated data, which needs minimal effort and to some extent minimal differentiation to be made available. These organizations create value by building databases and selling the data to third parties (Deloitte, 2012; Klaus, 2011; Thomas & Leiponen, 2016). These organizations usually operate in situations which are busy with data traffic. As example, wearable device manufacturers that sell the data to insurers can be qualified partly as data suppliers.

Data suppliers use various pricing models such as freemium, pay per use, API-access, and advertising. The freemium pricing model is a model where a company gives basic simple data away for free to encourage customers, to purchase premium data for a price. Pay per use -pricing model functions as it's called, data is made available for sale, and it is priced for the used amount (Thomas & Leiponen, 2016). Through the API-access (application programming interface) pricing sells access to organizational software. API-access is used by software developers to connect their own applications to the one offered by the supplying organization. This access allows the software developers to use data provided by the supplying organization actively in their own software (Braunstein, 2018). Additionally, one pricing method is advertising, where the data suppliers add advertising to their service. These advertisements are used to provide revenue to the supplying organization. In this case the service is usually free to use, but will be disturbed by the advertising. These

advertisements can be usually removed by paying a premium to compensate (Deloitte, 2012).

4.3.2 Data managers

Data managers are organizations or individuals that clean, prepare and catalogue information that is not already in an easily usable form. These organizations enhance very raw data to make it more efficient and interpretable. These organizations increase value by transforming different storage formats or translating data languages so that it is more accessible to other individuals and organizations (Deloitte, 2012; Klaus, 2011). Data managers act as facilitators of data, but do not use the data or re-use it themselves (Thomas & Leiponen, 2016).

These companies use similar pricing models as data suppliers including, subscription, pay per use and adverts. The subscription-based pricing model refers to data managing providing services based on a fixed amount at an agreed time period. The types of subscriptions can vary depending on what is included service wise and depending on the time period. The price of the subscription is tied to the provided service and time period (Thomas & Leiponen, 2016). These pricing models are used by data managers as the generates revenue directly and additionally provide cost-effective solutions to organizations that do not have the data themselves.

4.3.3 Data custodians

Data custodians refer to organizations or individuals that provide an infrastructure that enables the resale and reuse of data. An important role of these custodians is to act as identity management service provider between individuals and merchants who wish to use and or collect data (Schwab et al., 2011; Thomas & Leiponen, 2016). As example, the Finnish social security agency KELA are building an infrastructure for well-being data. KELA will build and administrate this infrastructure that will involve private individuals and commercial entities that can use the data provided by private individuals.

Pricing models used by data custodians are not currently clearly understood as organizations using this model are only at the moment emerging, but research suggests that subscription may be a viable model (Thomas & Leiponen, 2016).

4.3.4 Application developers

Application developers can be defined as organizations and individuals that produce, design, and commercialize applications which enable data commercialization. These organizations, and individuals produce software so that the data output is readable by humans. Application developers usually partner with a wide range of different technology companies to provide

innovative solutions for clients and end-users (Deloitte, 2012; Tammisto & Lindman, 2012). For example, the Finnish technology company Firstbeat provide software for the majority of wearable device manufacturers. This software is used in the devices to provide well-being data collection from end users (Firstbeat, 2020).

The pricing model commonly used by data application developers is licencing. This model is similar to other application developers, and refers to the process where the right to use the application is sold (Thomas & Leiponen, 2016).

4.3.5 Service providers

Service providers can be defined as organizations or individuals that develop new utilization methods, or services for data. This developing can be specific insights or analyses of data. Service providers analyse available data and provide valuable insights from the analysed data. These insights are used by organizations to generate new value-added services and platforms for transactions, such as ad targeting. Additionally, these services manage data and create applications that are available at the right time for a particular purpose (Piccoli & Pigni, 2013; Thomas & Leiponen, 2016).

Service providers use a variety of pricing models. They can use similar pricing methods as data suppliers. For example, they can allow organizations free to their platform but take a price for using the data on the platform. Additionally, they can use pay per access through API-access for developers to develop different applications onto the platform.

4.3.6 Data aggregators

Data aggregators can be defined as specific organizations that are focused on aggregation, collection, and repurposing of data. Data aggregators search and contextualize found data and identify correlations, efficiencies and visualize relationships (Thomas & Leiponen, 2016). These insights are then sold as value added services to consumers, businesses, and governments. As example services that integrate clinical and well-being data for regulators to improve on clinical decision making can be defined as data aggregators (Deloitte, 2012; Piccoli & Pigni, 2013).

The pricing method used by data aggregators depends on the role they act within the data platform. As they usually operate through different platforms the most used pricing model is charging for access, for example membership or charging per use. Some data aggregators use similar pricing models as service providers.

TABLE 2 Data commercialization models

Type of Commercial use	Role	Pricing method	Reference
Data suppliers	Provide data that can be used by others	Freemium, pay per use, API-access, and advertising	(Braunstein, 2018; Deloitte, 2012; Klaus, 2011; L. D. W. Thomas & Leiponen, 2016)
Data managers	Clean, prepare and categorize information that is not already in an easily usable form.	Subscription, pay per use and adverts	(Deloitte, 2012; Thomas & Leiponen, 2016)
Data Custodian	provide an infrastructure that enables the resale and reuse of data.	Subscription	(Schwab et al., 2011; L. D. W. Thomas & Leiponen, 2016
Application developers	Produce, design, and commercialize applications that enable data commercialization	API-access	(Deloitte, 2012; Tammisto & Lindman, 2012; L. D. W. Thomas & Leiponen, 2016
Service providers	Develop services that use data.	Freemium, API-access	(Piccoli & Pigni, 2013; Thomas & Leiponen, 2016)
Data aggregators	Focus on data aggregation, collection, and repurposing.	Access fee, pay per use.	Deloitte, 2012; Piccoli & Pigni, 2013)

4.3.7 Commercial use of well-being data

Commercial use of personalized well-being and health data has increased in recent years in a more silent manner. The controversial nature of selling ones most personal information has kept the business more on the background rather than in the spotlight. The most prominent commercial uses currently fall in the field clinical health data, that is provided in an unidentifiable form. This data is sold to medical equipment manufacturers, software companies, pharma companies and to insurers (Accenture, 2018). The most prominent use of the data in these cases is to help in developing better equipment, medication, or new software to advance personal healthcare (Accenture, 2018).

As example for existing health and well-being data related commercial solutions is the company Validic. Validic provides a streaming platform for

health data which is gathered through different smart devices, wearables, clinical sensors, and well-being applications. Validic gathers the data from these variable resources and creates valuable insights to well-being professionals, insurers, pharmaceutical companies and for health IT companies (Validic, 2020). Another example for an organization operating with well-being and health data commercially is Verily. Verily creates tools and devices that can be used to gather, organize, and use health data, through which interventions are created to prevent and manage diseases. The data gathered by Verily is provided for clinical researchers, specialist in care and innovators (Verily, 2020).

When searching for commercial uses of large amounts of well-being data it was apparent that no relevant organization focuses solely on the commercialization of well-being data. Despite of this, these examples can be used to provide information on what roles and options exist for the Kanta PHR and its stakeholders, when operating with well-being data.

4.3.8 Challenges for the commercial use of data

As the commercial use of data becomes more relevant and increasing efforts are done to do so, exiting challenges related to the process must be overcome. The most prominent challenge comes with data regulation and individual privacy. One issue with data regulation is that there is a lack of global interoperability when it comes to commercial use of data (Thomas & Leiponen, 2016). This means that each country is developing their own regulatory frameworks. As in the case of Kanta PHR by Kela, the Finnish regulation does currently not allow for the PHR to be constructed and networked as intended. This is most apparent through the fact that the country's regulation does currently not allow private individuals in Finland to provide data gathered by themselves to be used by healthcare professionals (Thomas & Leiponen, 2016; KELA, 2020). This is a considerable challenge, as this limits even the non-commercial use of well-being data.

Fragmentation of data and its ownership is another relevant issue regarding the commercial use of data. Currently potential data is fragmented differently depending on the industry it represents. For example in the case of health and well-being data, the question arises who owns the data gathered by private individuals (Thomas & Leiponen, 2016). The ownership of data is divided between the individual, the application / device manufacturer, and by the data platform that houses the data and provides it to other organizations (Thomas & Leiponen, 2016). For example, the data gathered and stored to the Kanta PHR is owned by the individual from who the data has been gathered from (Kela, 2020).

Data privacy can be considered a considerable challenge for the commercial use of data. In the case of health and well-being data, the gathered data can be regarded as highly personal as it includes very specific information on the health of private individuals (Szlezak et al., 2014). The type of challenge

data privacy faces depends on how it is stored, distributed, individualized, or anonymized. Each of these issues need to be addressed by organizations and regulators when the commercial use of data is made global (Szlezak et al., 2014).

These challenges on the commercial use of data are not within the scope of this study but are acknowledged, as data privacy and interoperability are important aspects of well-being data.

4.4 Conclusion of value creation

The value creation process can be defined in different ways, from which this thesis uses the goods-dominant and service-dominant logics as described by Vargo & Lusch, (2004). Through the value dominant-logic, value is created by a manufacturer and transferred to a customer. In the logic, value is created when an offering is exchanged into something other valuable for example money. In the service-dominant logic the value is created not only by exchanging goods, but also customers and partners of the firm for example through services (Vargo & Lusch, 2004).

A method to showcase value creation in a commercial or private context are business models. Business models are used to determine an organization constructs and how it generates value through its operations (Al-Debei et al., 2008). The business model concept provides a framework for organizations working in a digital context for capturing and creating value. The business model concept by Al-Debei & Avison, (2010) recognized four dimensions that need to be considered when creating a business strategy for digital organizations (Figure 2). Those four dimensions are value proposition, value architecture, value finance and value network. These dimensions are constructed of different elements that provide the basis for each different dimension. The value dimensions can be applied to different empirical settings such as to cryptocurrencies by Kazan et al., (2013). This showcases the possibility to use not only the single dimensions but the whole framework on different subjects of study for example healthcare or well-being data.

Thomas & Leiponen, (2016) recognized six different business models for data ecosystems. These business models represent different roles an organization can take when commercializing data. The different business models differ based on value construction and pricing methods. The commercialization of data has its own restriction as many technological commercialisations that address information on private individuals. Currently the most prominent restrictions are with data regulation, data ownership and privacy. To fix these problems, regulators are working around the globe to find a way that will suite every party involved in the operation of commercial use of data.

5 SUMMARY OF THE LITERATURE REVIEW

The literature for this research was gathered to form a scientific foundation for the empiric part of this study which seeks to find out how can value be created with well-being data through a national personal health record.

The first chapter identified well-being from health as well-being is regarded as a subcategory of health. Well-being was defined by defining health and separating well-being from that definition. Well-being itself was defined by researching different approaches to well-being made by scholars. This resulted in the finding of 8 different aspects of well-being (Roscoe, 2009). From these eight findings the most relevant to this study was selected as being the definition of physical well-being as its aspects most common form available for data collection. Well-being data was differentiated from ehealth as being information more easily collectable from an individual than clinical data, which ehealth corporates. To help define well-being data, different devices through which only well-being data related to one's physical well-being, such as exercise and chronic disease information can be gathered were identified and examined. These wearable devices were divided into three different categories, wearable computers, wearable electronics and intelligent clothing (Malmivaara, 2009).

For well-being data to work or provide any value, a location where the data can be stored, accessed, and managed by individuals and professionals is needed. Personal health records or PHR were reviewed as they are defined as a place where individuals can store, view, and manage data related to their health and well-being. This data can be combined with clinical and act as complimentary data to clinicians and other health specialist caring for a patient (Steele et al., 2012). Personal health records were review based on their architecture, functionality, finance, and stakeholders. To review personal health records as functioning platforms, three examples were presented, the Kanta PHR, Microsoft HealthVault and Lydia.

Value creation was reviewed through the methods of goods dominant and service dominant logics. Goods dominant-logic is the classical method of value creation where one entity creates a product which exchanges ownership

through a payment and focuses on operand and tangible goods (Vargo & Lusch, 2004). The Service dominant-logic is derived from the goods dominant logic and focuses on operant and intangible resources(Vargo & Lusch, 2004). It was also addressed how these two value creation theories can be applied to an industry that incorporates both the public and private sector. To provide theoretical background for the research question, the theoretical background of business models was provided. Within the business model, four different dimensions were identified which provide a basis for creating a business model in a digital context. These found dimensions are: Value proposition, Value architecture, value network and value finance. In addition, this chapter introduced six recognized business models for data. These business models provided different roles for organizations operating in a commercialized data environment. With the addition of these business models, a suitable role for Kela can then be introduced and suggested for the future.

Based on the literature researched for this study a framework for value creation of well-being data in a national PHR is created. The framework is formed on the structure of the four business model dimensions by Al-Debei & Avison, (2010), and modified to present four value dimensions formed through literature on well-being data, personal health records and value creation. The four value dimensions are value proposition, value network, value architecture and value finance. Value proposition is used to present the value-element of well-being data and presented through what can well-being data create value. Value network describes the stakeholders and actors needed to create value with well-being data. Value architecture presents the technological architecture and structure that is needed to support value creation with well-being data. The value finance dimension presents how the value creation process is financed and how financial value is created. The created framework (FIGURE 10) will be used as the theoretical framework for the empirical research in this study and used to combine research literature with empirical findings to answer the research question.

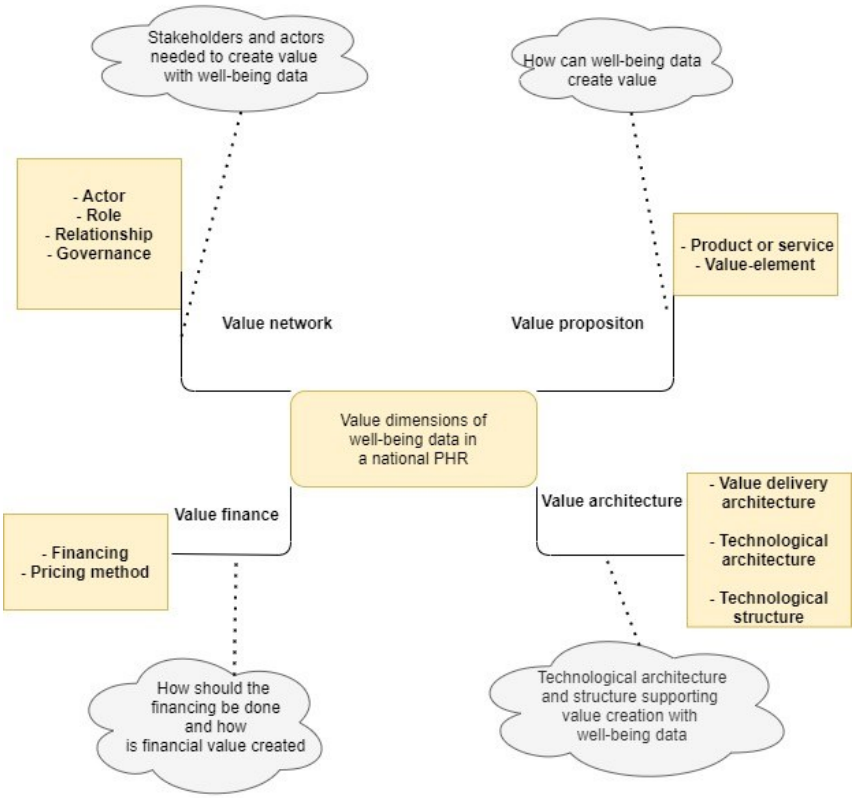

FIGURE 10 Value dimensions of well-being data in a national PHR

6 RESEARCH METHODOLOGY

The objective of this study is to examine the value creation capabilities of well-being data in a national PHR. This chapter examines the research methodology implemented for the empirical part of this study. The chapter will first introduce the study's background and goals, then present the methodology used to carry out the research are presented. After the methodology, the data collection method and process conducted for the research are discussed. presents the data collection method and process conducted for the research. Finally, the data analysis process of the conducted research will be presented.

6.1 Background and goals

The empirical setting for this study comes from the project that the Finnish Institution for Social Insurance (Kela) is conducting. Kela is developing a national personal health record which will allow private individuals to upload their personal well-being data gathered by third party applications and devices to a national repository (Kela, 2020). The intention is that the stored well-being data in the PHR can be combined with clinically gathered health data and thus enable healthcare professionals to provide patients with higher quality care. Kela will be incorporating also commercial partners into the project. As they are necessary for it to function as intended. The project provides a suitable case to study, as the involvement of commercial actors to a national PHR -project has raised challenges. As the project is conducted by national institutions, there is currently no plan to commercialize the PHR or to provide it with direct commercial opportunities. This brings a challenge for the commercial partners, as their motivation is often linked with financial opportunities. With the lack of direct monetary compensation options, the PHR developer Kela needs to find other ways motivate and create value for commercial partners linked with the Kanta PHR. This has to be done in balance with the public sector and citizens for whom the PHR is being constructed. This challenge provides an

opportunity for this study to value creation capabilities of well-being data in a national PHR.

The goal of this study is to provide information not only on how value is created, but shine light on what is needed so that it can be created with well-being data through a national PHR. This will incorporate the value creation capabilities for both the public and private sectors in the Kanta PHR. This study will provide an overview on the subject, and form a foundation for future research. The research additionally intends to provide information for other similar projects that may be conducted in the future.

6.2 Method

The empirical research of this study was conducted using qualitative methods in the form of an exploratory single case study, in which individuals from different stakeholder organizations were interviewed to get a view on what value creation opportunities well-being data offers through a national personal health record. This subchapter will go through the theory of qualitative research, single case studies.

Yin (2015), describes qualitative methods with five distinguishable features, studying real people in the real-world, representment of real experiences from actual perspectives, account for real-world contextual conditions, easing explanation of social behaviour and thinking by contributing new insights or concepts, and acknowledging the potential of multiple sources for evidence (Yin, 2015). The first factor involves studying lives of people as they experience it in the real world. Qualitative research studies people in their individual setting as persons, which makes it possible for the subjects to express themselves freely without any pre-set conditioning on their answers (Yin, 2015). Representing perspectives of participant individuals allows participants of the study to express themselves freely, these opinions and views are used as the purpose of a study. In this way the study brings out events and meanings a person experiences and gives in the real world in contrast to quantitative studies where results can be biased by presumptions of the researchers (Yin, 2015). Distinguishing qualitative methods from other research methods through embracing contextual conditions means that the research takes place within the different conditions, such as cultural and institutional conditions. These conditions are taken into consideration in qualitative research as different conditions affect and influence human behaviour and as such the subjects relevant to research. (Yin, 2015). New insights or concepts are used to ease the explanation of social behaviour. Qualitative methods can be used to explain different social processes of why and how people act in different situations or settings. Through this new concepts can be developed, such as how a certain method can be executed in a more effective manner (Yin, 2015). Yin, (2015) argues that qualitative methods can additionally use to provide new insights on existing real-life conditions and events. Distinguishes qualitative methods from

other research methods, acknowledgement of multiple resources, explains the realisation that collection, integrating and presenting data is valued highly (Yin, 2015).

This thesis is conducted as a single case study, which is a qualitative research method. The case study as a qualitative research method described by Yin, (2003) as being an empirical study method that seeks to answer its research questions by examining a particular research setting or case in-depth and comprehensively instead of looking at large statistical generalizations. As the name implies single case studies seek to answer their research question based on a single subject. Yin, (2003) argues that single case studies can be reasoned when an researcher is trying to prove a solid theory, he has not had the chance to study the case before, if he is researching a common case or an particularly unusual case. This use of a single case can be argued in this study through the reasoning of having a particularly unusual case for study. The case being the national personal health record project Kanta PHR. The use of a single case study was selected as the research topic is related to the unique setting the Kanta PHR has as a national project that seeks commercial partnerships to function as intended. Single cases have been criticized for there are limited generalizability compared to multi-case studies, but can still offer findings that revolutionize and change industries (Puusa Anu, 2020).

The five features of qualitative research and the characteristics of a single case study make the chosen methods optimal for this study, which aims to examine the possible way well-being data creates value in a national PHR. The single case study allows the research to focus on finding answers for an existing case. This also allows for linear data collection as information needs to be collected on only a single case. The research is about real people in a real-world context, as it involves persons that operate in professional fields related to the existing Kanta PHR. Perspectives based on real world experiences are gathered from individuals with different professional backgrounds and were allowed to express themselves anonymously and freely. This is relevant as the study does not define or limit the meaning of value, and as such interviewees answer the questions through their own conception of value. Embracement of contextual conditions is seen in this study from the basis that research seeks to find answers to the research question through a single case and acknowledges the limitations as a consequence. Additionally, the contextual conditions are taken into consideration when analysing the research data, as the interviewees for this research come from a variety of professional backgrounds which affects their answers. For example, the background of an interviewee is expected to affect the aforementioned conception of value, as one can expect that private sector actors have a different conception of value than their peers in the public sector. The private sector is expected to view value from more of a financial point of view, versus the public sector who is expected to view value more as a common good. The use of new insights or concepts to ease explanation of social behaviour is seen in this thesis through its research problem which seeks to find new insights on how well-being data can create value through national

personal health records. The resulted insights can in turn be used to create a new concept for value creation. These insights can also be used in the development project of the Kanta PHR and help overcome existing challenges.

6.3 Data collection

Interviews were selected as the empirical data collection method, as they were determined as a valid way to gather high quality data from over a subject that is not widely known. It was also acknowledged that interviewees would have a wide variety of professional backgrounds. When using interviews as a data collection method, the researcher channels the thoughts, ideas, experiences and knowledge of the interviewees and determines how to approach these answers (Hirsjärvi & Hurme, 2008). The use of interviews to collect data for this thesis were used because it was known beforehand that the research subject will provide a multitude of different answers, knowledge can be deepened by asking the interviewees to provide examples or additional questions can be asked, and answers can be easily clarified (Hirsjärvi & Hurme, 2008).

This thesis uses as its data collection method the semi-structured interview method and more specifically themed interviews. Semi-structured interviews are commonly described as interviews in which the questions for the interviewee are not identical or the order of the questions can vary (Hirsjärvi, 2008). It is characteristic for semi-structured interviews to have similarities in aspects between interviews, but not all of them are the same which is also why themed interviews are classified as semi-structured interviews (Hirsjärvi, 2008). Themed interviews differ from other semi-structured interviews by not focusing on particular questions, but instead focuses on themes on which the flow of conversation is based. Themed interviews take into consideration the interpretations the interviewed person makes and focuses on the subject or theme the interviewee is talking about (Hirsjärvi & Hurme, 2008). This research takes advantage of themed interviews by revolving the interviews around same subject, but shape the questions based on the professional background of the interviewee.

The decision to interview different stakeholders in an explorative fashion was made as the subject has not been studied extensively before, so to gather relevant information, the best opportunity is to interview individuals who know the nature of the project. The first phase of the data collection process was planning the interviews. The planning process included drafting questions / themes for the interviews, determining the requirements for the interviewees and booking the interviews.

The questions / themes for the interviews were based on themes deemed important by literature, research goal and research question. Three themes were selected for the research:

1. Well-being data

2. National personal health record / Kanta PHR

3. Value creation opportunities of well-being data through a national personal health

The themes were selected as a basis for the interviews as they offered a wide perspective on the subject and allowed interviewees to give insights on the subject even if their work was not already directly related to all of the themes. The themes included sub-questions that guided the interview but allowed for an open discussion on the subjects. This allowed the interviewees to give broader answers on subjects that cannot be answered unambiguously.

All interviews were based on the same themes, but the wording differed to better suit the background of the interviewee as in if they operate in the public or private sector. This was to get more comprehensive responses from the interviewees as they could answer from their own point of view instead of theorizing on a subject area they were not as familiar with.

Prior to the research requirements for the interviews and interviewees set. For the research there had to be participants from both the private and public sector. This was set because the Kanta PHR seeks to operate in coordination with both sectors so to get a comprehensive overview on the subject, both parties were needed.

Another requirement was that the interviewee had to be professionally related to the Kanta PHR or have a professional relationship with well-being data. Emphasis was put on the requirement that the interviewee had to have a professional relationship with well-being data. This emphasis was made because firstly, the Kanta PHR is in its early stages and is not yet widely known and secondly, because the research is made from the point of view of well-being data. Additionally, it was important to have many professionals working with well-being data from a variation of backgrounds as well-being data has broad definition. The different backgrounds assisted in getting a comprehensive view on the subject. A minimum of 7 interviewees was set before the research began. This was determined as the minimum number of interviews required to get an overview on the subject, and to gain information on the relatively unknown subject.

The data collection was conducted in three phases: selecting and contacting the potential interviewee, exchanging messages with the interviewee, and executing the actual research interview. Potential subjects for the interview were searched from the internet by selecting known organizations that operate with well-being data, by referral by persons that participated in the interview that knew other potential interviewees, and with the use of personal networks. The use of different channels for finding interview partners made it possible to diversify the backgrounds of the interviewees, and thus provide a wider view on the subject. Potential subjects for the interview were contacted by e-mail in which the subject of the research was explained, and the interest to participate

inquired. In a total of 15 potential interviewees were contacted. The amount was deemed sufficient as it was expected that not all of the contacted subjects would answer or be willing to participate in the research.

After contacting potential interviewees, e-mails were exchanged with the subjects about the research. Usually the messages included further questions on the research subject or parts of it. During the exchange of e-mails the setting and the schedule of the interview were set. Before the interviews were held, the interviewees were sent a document about the privacy policy regarding the interviews and participation in the study.

In the beginning of the interview, the privacy policy agreement regarding the interview was discussed, and an emphasis was put on the anonymity of the interviewees. A total of 9 interviewees were interviewed for the research. 8 out of the total 9 interviews were conducted using online communication software's Google Meet and Skype for Business. One of the interviews was conducted face to face. The small amount of face to face interviews is explained by the long distance between the interviewer and interviewees and the COVID19-pandemic during which online meetings were encouraged. All interviews were conducted in the Finnish language, as it was the native language of the interviewees and thus made it possible for the interviewees to give broader responses to the themes and sub-questions. The interviews were conducted between the months of March and July of 2020. The long timespan of the interviews can be explained by the time needed to find and assess different professionals for the interview. The interviews took an average time of 45 minutes and were recorded with a recording device.

The first two interviews were used as pre-interviews through which the questions and themes could be assessed and evaluated. After the first two interviews the wording of a sub-question was changed and sub-questions in a theme were reconstructed. This made the flow of conversation of the interviews more natural and made the subjects easier to understand.

The amount of interviewees for this research were limited based on the research topic. To find the most potential persons for the interviews, occupation themes were selected. These topics were healthcare, well-being, well-being data, health technology and public healthcare. Based on the determined themes a total of nine persons were interviewed for the study. The interviewees were all linked to the subject by occupation in the sense of working actively with well-being data, health technology, the Kanta PHR or public health. The interviewees varied on occupations in the public and private sectors. The interviewees, their occupations, organizations, sectors, and previous knowledge of the Kanta PHR can be seen in TABLE 3.

TABLE 3 Interview participants

Interviewee	Occupation	Organization	Sector	Previous knowledge of Kanta PHR
R1	Product owner	Government institute	Public	Yes
R2	Specialist	Government institute	Public	Yes
R3	Clinician	Hospital	Public	Yes
R4	Health specialist	Private technology	Private	No
R5	Clinician	Hospital	Public	No
R6	Consultant	Private technology	Private	Yes
R7	CEO	Well-being data	Private	Yes
R8	Researcher	Well-being data	Public	Yes
R9	Consultant	Private technology	Private	Yes

For the interviews to provide data for the research, the wanted information needs to extracted from the interview data. Results can be extracted from the interview data by analysing the data and finding insights throughout the process.

6.4 Data analysis

This chapter will present the analysis conducted on the data received from the conducted interviews. The data analysis for this research was conducted in an inductive way following the five steps by D. R. Thomas, (2003). The selected methodology made it possible for the researcher to find causes and effects from different themes.

The first step of data analysis is formatting the raw data. The gathered data is formatted into a unified form and differences in the data are formatted to be similar. This is done to improve data quality and make it easier for the

researcher to conduct the next steps of the analysis process (Thomas, 2003). As the first step of the process in this study, the interview recordings were played back using VLC media player and transcribed to separated documents under correct themes and sub-questions with Microsoft Word. The transcribing was done by setting the audio file to play back on a speed of 0.75 which as a result made the audio slower and made transcribing easier as you had more time to write each word and sentence.

In the second step of close reading the text, the prepared and refined text is read in detail to familiarise the data. During the familiarisation, the researcher can already recognize some levels of themes in the data. This will help the researcher to categorize the data in the next step of data analysis (Thomas, 2003). After each interview was transcribed in separate documents, they were read through and listened to again to check if information was missing from the transcriptions, or if mistakes during the transcription process were made. The thorough process of transcribing made it possible to already make meaningful observations, which later helped with the coding and analysing of the data.

In the third step of data analysis, creation of categories the researcher seeks out similarities in the collected data and creates categories and themes based on these found similarities (Thomas, 2003). The first categories the researcher creates are made based on the close reading the researcher has previously done. Depending on the type and amount of data, the researcher can use different software to aid in the categorising (Thomas, 2003). For example, sentences that have similar themes in them can be coded in similar colours in the first step of categorization in preparation for the next steps of data analysis. In this step the transcribed interviews were imported to the Microsoft Excel programme and analysed with the software. The use of Microsoft Excel made it possible for the answers to be colour coded and grouped and then split into separate sheets from the codes that were generated by the researcher. The grouping of the observations was first done by identifying themes relevant to the study from the transcribed interviews and grouping these theme related observations onto separate Excel -sheets. Relevant themes from the research data were made by reflecting them to the literature provided in this study.

The fourth step of overlapping coding and uncoded text takes into consideration the fact, that in qualitative research a part of the data can belong to more than one category and a large amount of data may not be coded to any category as it is deemed irrelevant to the research and would not contribute towards its goals (Thomas, 2003). In this step the answers were read through to see more in depth if they belonged to multiple categories. There was no overlapping when considering the coding based on the themes as the interview questions were focused on certain themes, but there was overlapping within the answers based on the theme, which were then split into separate categories in the next step.

In the final step of data analysis, the created categories are analysed and subtopics such as new insights are looked for. In this step appropriate quotes

related to the main theme should be selected. Similar categories with similar meanings can be linked together to comprise a comprehensive and clear analysis of the data (Thomas, 2003). After the observations were grouped into the most relevant themes, the themes themselves were analysed to provide new themes and observations from within the top theme. After subthemes were observed, these were then moved to separate sheets to further analyse findings. The analysis provided quotes, that were selected to be represented in the result section, to support findings. For example, when looking for value propositions sentences by interviewees related to value proposition were selected:

"Exact data through which a clinician gets a large amount of accurate data about a patient frees more time for the care itself. This in turn makes it possible to provide a higher quality of care."

The analysis was conducted until the research data was extracted to the point that no new observations related to the research could be made. The steps conducted during the data analysis are depicted in TABLE 4. The analysis of the research data provided a large amount of observations that are presented in the research results that are presented in the next chapter.

TABLE 4 Conducted data analysis process

Step	**Description of the conducted step**
1. Data formatting	Interviews are transcribed from audio recordings, by playing them back and writing the text into word documents.
2. Close reading	Transcribed texts were read through while listening to the audio to find missing details. During this step, observations were already made.
3. Category creation	Interview answers were imported into an Excel-sheet and colour coded depending on the theme of the answer.
4.Overlapping coding	Overlapping codes within themes were read through and marked for separation into separate categories
5. Data analysis	Subcategories were created within themes and quotations to be presented in the result section were selected.

7 RESULTS

This chapter will present the main findings of the conducted research. The chapter is divided into themes based on the interview and research data. The chapter will firstly present the findings related to the value proposition, secondly to the value architecture, thirdly to the value network, and finally the findings on the value finance. The results include direct quotations from the interviews which have been translated into English from Finnish by the researcher. The translation has been done in a way that the original wording and meaningfulness are preserved at the highest level possible.

7.1 The value proposition of well-being data in the Kanta PHR

The value proposition was approached through value creation methodology, in the sense of how could the Kanta PHR create value with well-being data. The observations identified from the research data focused on the element of finding the product or service and the value element the PHR could produce with well-being data. The identified value propositions from the research can be categorized into pre-emptive healthcare, enhancement of care quality, utilization of large mass of well-being data, data refinement, and a unitary platform for well-being software.

7.1.1 Pre-emptive healthcare

The most prominent proposition is the consequence of pre-emptive healthcare. It was mentioned by 55% of the respondents which included all of the interviewees from the public sector. The prominence of well-being data becoming one of the cornerstones of pre-emptive healthcare as it makes the common citizen more aware of their own well-being and allows them to monitor well-being on a more specific level. The pre-emptiveness would come as a result of the continuous monitoring of one's well-being and thus the

individual could recognize changes in their well-being, for example before symptoms of different ailments occur.

"It is important that people are also aware of their well-being as healthcare specialists only meet them when something is wrong. People should be the experts on their own well-being who if needed are then supported by healthcare specialists."

The result suggests that in the context of the Kanta PHR, the repository is seen by the public sector as a place where well-being data could be stored, and through which data could be monitored, and shared to entities, to provide pre-emptive care to individuals. Pre-emptive care would result from supporting healthcare professionals with complementary data.

7.1.2 Enhancement of care quality

The increasing quality of care was connected to the combination of an individual's well-being data stored in one easily accessible place. It was mentioned that currently there is no place for clinicians to find well-being information of an individual from a single place, but that in the case of a treatment process the information on an individual has to be either be provided by the treated person, dug from a vast collection of healthcare data or guessed by the healthcare specialist.

"Currently if I need information that will affect the provided care of a patient, I have to scan through old records of their previous visits, which can take quite a long time when considering the time that is allocated per patient."

The value from the saved time would come through the possibility of being able to provide more time for care per patient. This would allow more time per session for care and make it possible to provide care for multiple ailments if required per session. Additionally, it was mentioned that time and resources would be saved as the gathered well-being data and Kanta PHR would make it possible for healthcare specialists to provide evidence on the functionality of a certain treatment.

"If I have 12 patients for the day and to clear one it takes an hour, the time is taken away from the other 11. If all of the needed information would be available and accessible in quantity and quality, the process would be quicker, clearer, and of better quality."

"Often many treatments cannot take ailments away completely, and patients feel that the treatment is not working. If you could provide data to support the fact that the treatment has actually worked by showing for example, that their blood pressure has decreased, or exercise has become easier"

Based on these results the proposition of increased care quality, the Kanta PHR would make the work of healthcare officials more efficient. This would be done by saving time needed per ailment, per patient by easing access to the required information. Additionally, care quality could increase as the Kanta PHR could be used to provide well-being data to support the functionality of selected care methods.

7.1.3 Utilization of large well-being data masses

The utilization of well-being data in large quantities was proposed by 5 out of 9 interviewees. These included individuals from both the private and public sectors. The possibility of having a large quantity of diverse well-being data was seen as a great possibility. The large quantity was seen as a possibility to conduct extensive research on the well-being of a population, and through research find new ways to improve well-being on both a general and a detailed level. With the possibility to tap into a massive amount of well-being data, the data would provide possibilities to develop completely new services. The data mass was also seen as an opportunity to further develop private sector services in the sense that organizations with specific well-being related services could improve their services. This would be possible because organizations have a limited amount of data on which they base their results, and cannot thus provide services to individuals that are a 100% match with the person.

"With every data point and measurement, the services are more accurate and thus with more measurements and thus data on a large variety of individuals with different levels of well-being will make it possible to provide more accurate services regardless of an individual's demographics."

The results suggest that the Kanta PHR amass a large collection of diversified well-being data that could be used to improve service quality and accuracy of services operating with well-being data. Additionally, the well-being data would allow for the creation of new services, which are made possible by having a much larger scientific base backed by the large amount of data.

7.1.4 Data refinement

Related to, but observed as its own value proposition was data refining. In this proposition, the well-being data would not simply be gathered in mass and stored, but act as an entity that would be analysed, and from which insights could be drawn out.

"So long as there is a database full of calculated steps, there are minimal benefits. You would need an inference machine that analyses a massive amount of data that has a lot of interference and finds the beneficial things from the information."

This suggests that the value proposition would be insights found from the well-being data, which has been gathered individuals and stored to the PHR. This would mean, that the PHR would not only provide data for others to analyse but conduct analysis themselves.

7.1.5 Unitary well-being application platform

The unitary platform for well-being applications proposition for the Kanta PHR intends that the PHR acts as a platform on to which well-being applications and providers could set their application or service up and get access to other healthcare services and platforms. It was suggested that the application providers would only need to go through one integration process in which their application and service would be validated. Through the single integration, it would be possible then to get the application and service to function with different healthcare service providers who are already connected through a single platform.

"A single integration to the healthcare sector would save us and other service developers a lot of time and money because instead of going through 20 validation and integration processes we could focus on a single one and divert resources elsewhere."

This suggests that the value proposition of Kanta PHR should be a platform for well-being data applications that would through a single integration be able to be used from all other nationally connected electronic health records and health services. This would save developers and service providers development costs, provide visibility amongst users, and eventually provide a larger user base.

7.1.6 Summary of the value proposition

The results suggest that well-being data in the Kanta PHR does not have a single value proposition, but a variation of propositions that stakeholders can use based on their intended use. Based on the results, the provided value propositions for well-being data in the Kanta PHR revolve highly around the proposition that the PHR should be used to save resources by making existing processes and services more efficient. Firstly, gathering a large, diversified well-being data mass, secondly refining this data, and thirdly making it available to both the public and private sector which could use the data and the PHR itself to improve their current and future processes, services, and products.

TABLE 5 Summary of the value propositions of well-being data for the Kanta PHR

PROPOSITION	DESCRIPTION
PRE-EMPTIVE HEALTHCARE	Pre-emptive care would result from supporting healthcare professionals with complimentary data.
CARE QUALITY	Save time by easing data access and providing data on the functionality of a selected care method.
DATA UTILIZATION	Allow the use of gathered diverse data to help optimization of other well-being related services.
DATA ANALYTICS	Provide beneficial insights from the gathered data.
SOFTWARE PLATFORM	Providing a single integration point for well-being applications and a way for the applications to be utilized nationwide.
PRIMARY VALUE PROPOSITION	Making large amounts of diversified well-being data available for the public and private sector to enhance existing and future processes and services.

7.2 The value architecture of well-being data in the Kanta PHR

Value architecture was approached through possible value delivery architecture, technological architecture, and structure that is needed for the Kanta PHR to support value creation. The observations identified from the research data focused on what kind of architecture and purpose the Kanta PHR should have to produce value with well-being data. As a distinction to the value proposition, the value architecture does not determine how the value is created but the means how the value proposition is supported. The identified value propositions from the research can be categorized into a simple database, centralized refined well-being data, well-being application platform, continuous measurement platform.

7.2.1 Database

The simple database solution for the Kanta PHR was mentioned by 5 out of 9 respondents from both private and public sector. The database was intended to

act as a place where users could gather their data through different 3rd party applications and the data could then be in turn accessed by healthcare specialists or other professionals. In one instance the interviewee remarked that depending on the future form of Kanta PHR a regular database with an interface for users and service providers could be sufficient but pointed out that, In these proposals, the applications and services would be integrated into the database through an interface that would operate in both mobile and web environments.

"An integrated database where you can save data from different applications. This database would then be accessed through a mobile or web interface."

This suggests that the proposed architecture for the Kanta PHR would be a database that simply stores data provided by 3rd party applications and services which can include both public and private sector organizations. This database could then be accessible through mobile and web-based applications and solutions.

7.2.2 Refined well-being data

Centralized refined well-being data was proposed by 2 out of 9 respondents. The refined well-being data can be linked to the value proposition where the Kanta PHR would create value by providing refined well-being data that includes insights on the gathered and stored data. It is suggested that the architecture should be built in such a way that not only should users and professionals to store and view gathered well-being data intermediately which is then refined by different service providers and stored back in a refined form. After the service providers have refined the data the architecture should make it possible for the service providers to send incentives or impulses to the user whose data has been refined for example, to inform them that they should go and perform a health check. Additionally, separate portals for users and service providers were suggested.

"A database and interface that makes it possible to store raw well-being data, which can then be refined by different services with the permission of the user. After the data has been refined, the service can provide the user with insights on their distinctive data and suggest further action in the form of let us say a health check."

This suggests an architecture that not only works as a simple database for stored well-being data gathered 3rd party applications and services but supports the value proposition of data refinement. This would allow further engagement of 3rd party services as they would be able to provide insights found from the stored unrefined data.

7.2.3 Centralized platform

Another suggestion forming around centralization is a form of a platform for well-being applications. This form of architecture was proposed by two individuals in the interview. This platform would provide a place where an individual could collectively see the data that has been collected from them, which applications have been used to collect the data, or have used the data, and additionally list all of the available services and applications in the system.

"A place where you can get a comprehensive view on which applications use your data and what applications are available. This would in my opinion though require both mobile and web interfaces."

It was also suggested in the interviews that the platform should house applications that are developed by small companies or start-ups, which could through the platform receive more visibility and more users. This suggests that the Kanta PHR should have its infrastructure so that all of the service providers available for the user can be seen clearly. The infrastructure should also allow smaller companies to promote their applications and services. This could support value creation for smaller companies as they would receive more visibility and a larger user base to get their potential business running. It is also important that all the personal data gathered from the user is continuously available for inspection, so the user can see for what his / her data has been used for.

7.2.4 Summary of value architecture

The results indicate that the most prominent value architecture model for the Kanta PHR would be a database that allows well-being data to be stored and refined but also acts as a platform for 3rd party applications and services. The platform would foster value creation for smaller companies, as they could receive visibility and user through it. These applications and services can be accessed by the user of the PHR and if allowed can gain access to the user's data. Data and service use transparency would be a high priority in the platform so that the user can anytime see how their stored data is being used. The platform should also be accessible through bot mobile and web-based interfaces.

TABLE 6 Summary of the value architectures for the Kanta PHR

Architecture	Description
Database	Stores data provided by 3rd party applications and services and makes it accessible through mobile and web applications.
Refined well-being data	Platform that allows data storage and supports refinement of stored well-being data.
Centralized platform	A platform that provides visibility to all accessible services and applications while also making data use transparent.
Primary value architecture	Mobile and Web-accessible database for well-being data that allows storage and refinement of data. Providing visibility for 3rd party applications with high transparency in user data usage.

7.3 The value network of well-being data in the Kanta PHR

The value network was observed through the notion of what stakeholders and actors are needed for the Kela PHR to create value with well-being data. The results regarding the value network were the most unanimous from research data. All of the respondents had answers regarding stakeholders. The most mentioned stakeholders were users providing the data, healthcare specialists/organisations, clinicians, service providers, the Ministry of Social Affairs and Health, the Institution for Health and Welfare, and Kela.

7.3.1 Data providers

The users or citizens who would provide the well-being data were mentioned by all 9 interviewees. The individuals providing data proved to be an obvious choice to the interviewees as without individuals providing data, there would not be a construct through which the value could be created. The data providers are directly linked with the service providers as it was mentioned in the interviews that without data there would also be no service providers.

"It's a vicious circle as value cannot be created if there is no data, service providers will not join if there is no data to be used and users will not join and share their data if there are no services through which they themselves can receive value."

This implies that data providers are critical to the existence of the Kanta PHR as without data providers no other stakeholders could or even would operate or use the PHR.

7.3.2 Healthcare specialists and organizations

Healthcare specialists and organisations were also mentioned by all of the interviewees. The healthcare sector was also seen as a fundamental stakeholder as the sector would make the value proposition of pre-emptive healthcare possible. The interviewees mentioned that the healthcare sector would include organizations and entities from both the private and public sector. From the public sector the social and healthcare administrative regions were mentioned as they are a central figure in the Finnish healthcare system and from the private sector, occupational health providers were mentioned as they were seen as the most prominent private sector partner from within the healthcare sector. The occupational health organisations were mentioned as every employer is required to provide these services to their employees. So, it would be a logical approach to also provide well-being data services through occupational health services. This would benefit the employer and employee.

"If you get organizations to join that have other companies as customers, for example, occupational health organization, other application providers would probably be interested in these clients as potential customers."

Even though clinicians are essentially healthcare specialist, they received multiple individual mentions as critical stakeholders. Clinicians were mentioned as one the primary user group of the Kanta PHR as they would access and actively use patient data in their line of work. Clinicians were also seen as one of the key elements for the value proposition of pre-emptive healthcare as they would provide for the care in the case that the gathered well-being data shows something that needs to be looked at by a professional. Another argument for the clinicians was the need to engage them in the development process of the Kanta PHR

"I feel that it is important to also involve clinicians directly in the development process as they will be one of the primary users and can provide important insights on well-being and health altogether."

Based on the result healthcare specialists and organizations have an important role in the value creation of well-being data through the Kanta PHR. This importance applies to both the public sector care givers and commercial organizations. The emphasis was put on the different ways these two sectors can provide value through these services. The public sector organizations with their clinicians would provide effort through the universal healthcare system and provide a higher quality of care. The commercial organizations would

provide their own effort for improving care quality but can additionally bring in end users through their customers, which would lure in more service providers and application developers. High emphasis towards clinicians comes not only from the fact that they would be actively using the well-being data but should have an important role in the development of the usage of well-being data in healthcare.

7.3.3 Service providers

The most mentioned stakeholder after the data providers and healthcare specialists were the service providers. The term service providers encompass the developers and developing organisations that create and / or integrate their applications and services to the Kanta PHR. These application and service providers were simply intended to be technology partners for the Kanta PHR. The application and service providers are needed to provide means for gathering and transferring the gathered well-being data to the national data repository. The interviewees talked about service providers and application developers universally, but some of the interviewees distinguished different types of services and from the category. The mentioned service providers were organisations which would analyse and refine the existing data and provide insights on the data. Also, service providers who would provide continued services to individuals who have provided the data. As example of these services were wellness coaches who would provide individuals with tools on how to improve one's well-being and health.

"Services that could provide something after based on the data you have stored into the PHR. For example, if you have problems sleeping, you could allow your data to be examined by an expert who then provides you with solutions that help you sleep."

This implies that not only are the service and application providers an important part for value creation, but a crucial part. Based on the interviews there is no single type of service or application that is needed, but a multitude of different types. The wide variety of applications and services would provide a better base for value creation and more opportunities to create comprehensive value.

7.3.4 Kela

The Finnish Social Insurance Institution or Kela itself was an obvious choice for the interviewees. This comes from the fact that Kela is the main operator and developer of the Kanta PHR. Kelas main responsibility in the development was seen as developer of the data repository for well-being data and also provide the basis on which application and service members could build or connect their services / applications onto. Kela would not only have an obvious choice in the development of the Kanta PHR but also as having a major role in communicating and working with other stakeholders and actors related to the PHR. Kela was seen as a link between the public sector partners and private sector operators. These two sectors could operate in accordance with the Kanta PHR with the assistance and guidance of Kela.

"Well, Kela is the main developer of the PHR, the sole provider of the technical infrastructure and current customer communication / activity is done by Kela, so I would see Kela is the most important party from the viewpoint of the whole project."

The role of Kela as a key stakeholder for value creation of well-being data through the Kanta PHR is undoubted as it is the developer of the technical infrastructure the whole project for the well-being data and the repository itself. Based on this the role cannot be disputed, but it needs to firmly thought out, as where the limit of the infrastructure developer goes.

7.3.5 Ministry of Social Affairs and Health and the Finnish Institute for Health and Welfare

The interviews raised also other proposed stakeholders for the Kanta PHR. One of the proposed stakeholders was the Finnish Ministry of Social Affairs and Health. The ministry was mentioned as Kela operates under the Finnish parliament and is observed through the ministry. As such the ministry observers Kela and the development of Kanta PHR and additionally has a role in providing the legal means for the operation. Another mention was the Finnish Institute for Health and Welfare (THL). The institute works in accordance with Kela on the development of the Kanta PHR as a partner.

"As Kela is the main developer of the Kanta PHR, it is strongly connected in the project with the Ministry of Social Affairs and health and the institute for health and well-being. These stakeholders are part of the governing element of Kela and are part of the development projects of other Kanta services and as such also part of the PHR project"

This implies that the value stakeholder dimension has to take into consideration governing entities when developing a national PHR using well-being data. These entities ensure that the project follows laws and regulation and additionally act as the backbone of the public sector in the PHR.

7.3.6 Platform company

Another mentioned stakeholder was the proposed platform company for the well-being applications and services. As in its proposed role the platform company would be the main contact between application / service providers and Kela, it would have a key role in the operation of the Kanta PHR and the value creation of well-being data through it.

"As integrations and business models with pharma and healthcare are big and difficult to conduct, so not every well-being application provider who wants to focus on serving their own customer segment does not want to go through long and difficult negotiations with all service providers. For a solution I would see a platform company that would conduct these negotiations with the services and platforms. "

Based on this result there is a need for an organization that would form a governing element or trustee for the commercial partners that operate with Kanta PHR. It is implied that as the public sector has understandably strong support from their foundation, application and service providers should also have a platform through which they could influence matters related to well-being data and the PHR.

7.3.7 Summary of suggested value network

Based on the results received from the interviews, the most prominent stakeholders of the Kanta PHR cannot be limited to a single entity, but a multitude of different entities. Based on the results the most prominent stakeholders are Kela, healthcare services, service or application providers, data providers as in persons uploading their well-being data to the platform, and clinicians as in doctors using the data to provide higher quality and comprehensive care. Also, the need for governmental partners to form and regulate the operation of the PHR and the use of well-being data. It is implied by the results, that as the public sector has a strong backing in PHR project, also the private sector should have a unified representative.

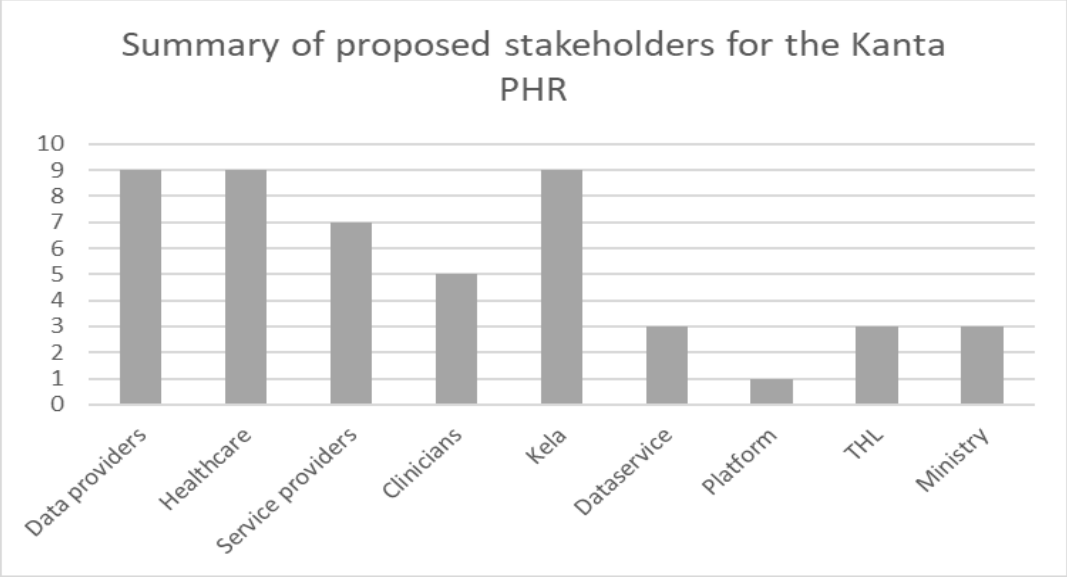

FIGURE 11 Compilation of mentioned stakeholders needed to provide value with well-being data through the Kanta PHR

7.4 The value finance of well-being data in the Kanta PHR

Value finance was approached through the setting on how could the Kanta PHR generate financial value and how should it be financed. Through this the answers regarded topics in the likeness of a billing method and way to finance the Kanta PHR. The research data raised six different value finance propositions. These suggestions were: Free use, basic taxation, value-based pricing, platform company, Freemium, and volume-based pricing. All of the interviewees mentioned that the basic operation of the PHR which would be the storing of personal data to onto it should be free of charge for the user / citizen.

7.4.1 Free of charge

Free of charge suggestion was based on the fact that the Kanta PHR is currently free to use by individuals and application developers / service providers, for the exception of a minimal regulatory fee when integrating a software to the platform. The interviewees based this on the current situation and the fact that the PHR is currently publicly financed and does not seek direct monetary compensation for the development. Instead the return of investment is seen to come from the developments of individual well-being and health as a result from the PHR.

"The service should always be free for the users. The benefit of the PHR comes from the saved healthcare expenses and as it is financed through government funding it will bring benefits in the future"

This suggests that the Kanta PHR financing should come as it is currently: Free of use to all stakeholders. The proposition suggests that as the Kanta PHR is a governmental development project with an aim towards the future. The participation in the project should be free and the only fees that service providers, and application providers need to pay for are administrative fees. The administrative fees are related to maintaining their service on the level the governmental regulations require.

7.4.2 Continued taxation

The continued basic taxation is suggested in the sense that the user would pay for the services he / she uses through the PHR. It was implicated that the user could for example decide to expand what kind of services they want to use through the Kanta PHR with their well-being data and then pay for them in accordance. It was also suggested that the additional services could be financed by the employer or another 3rd party.

"The service should be continuable, you would have the basic service of storing your data into the PHR and then if you want some services, you or for example your employer could pay for the extra services"

Based on this result, the Kanta PHR would be free to use, but the different services that use the users stored well-being data provided by 3rd parties would be optional and have a fee. The services could be paid for by the users themselves, insurance companies, the government, or employers on corporate welfare basis.

7.4.3 Value-based pricing

The value-based pricing was suggested as one billing method for well-being data in the Kanta PHR. The value-based pricing would value different types of data in a sense that an organisation would pay for the use of the data based on its type. It was suggested that data that is not so easily obtainable would be valued at a higher price than data that is easier to obtain and of less importance. As example, was given the difference of activity-based well-being data in the form of steps versus the more health-based well-being data of blood glucose level. The data on the blood glucose level would be valued at a higher price as the data can provide more valuable information as calculated steps. It was added that this raises the question / issue on how the different data types are valued and on what basis a type of data is worth more than the other.

"You need to look at the data the application is producing. For example, blood glucose is closely linked to healthcare and the clear value and benefits are visible. The value of it should be higher to the user and for healthcare."

This proposition suggests that the Kanta PHR should have a system in place which regulates and determines the value of different data sets. Based on this the Kanta PHR would have different categories for different types of data and billing would be done based on the quality, and amount of data.

7.4.4 Platform company

The platform company was mentioned as a proposition and continuation to the suggested platform company that would act as the main operator of different well-being applications and services. It was suggested that service providers and application developers would pay a fee to join the platform company, which would then handle the billing and money transferring between the companies and the Kanta PHR. The billing would be done through something.

"I would see it so that a platform company would be formed which would operate in coordination with software providers and help transfer data and money and would through that capture value"

This proposition suggests that the value finance of the Kanta PHR should be built upon a platform organisation to which applications and services would integrate onto and the organisation would organise the applications integration to the Kanta PHR. In this solution the billing of the use of the PHR would go through the platform which would then distribute the money with the integrated services and applications.

7.4.5 Volume-based pricing

An additional suggestion for the value finance of the Kanta PHR with well-being data was pricing based on the volume of data being used or how much a service is used. The suggestion intends that the organisations using the data stored in the Kanta PHR would pay for the data by the amount of data they have used. An alternative suggestion based on this was that organisations would pay based on the amount that how much their service has been used through the PHR.

"The PHR should be free for the users and free for companies to join. The pricing could come from the amount the companies use data from the PHR or how much their service is being used through it"

The proposition of volume-based pricing suggests that Kanta PHR would generate revenue by pricing use of the stored data based on volume or based on the amount service produced by the participating organisation is used.

7.4.6 Summary of value finance

Based on the results of the suggested value finance for the Kanta PHR indicates a need for the platform to be essentially free for citizens/users/data providers of the PHR and the service providers and 3rd parties using the PHR should be paying for the use. Based on the results the best option as the pricing method for the service providers and 3rd parties based on the volume of usage. This billing would either done through a single entity presenting all service providers or individual services would be billed independently. The ability for induvial users to pay for additional services on the PHR can be seen beneficial for both parties and these services could be financed by different entities for the user.

TABLE 7 Summary of the value finance propositions observed from the research data

PROPOSED VALUE FINANCE	DESCRIPTION
FREE USE	Free of use to all stakeholders, costs covered by government funding
BASIC TAXATION	The Kanta PHR would be free to use, but the different services that use the users stored well-being data provided by 3rd parties would be optional and have a fee.
VALUE BASED BILLING	The Kanta PHR would have different categories for different types of data and billing would be done based on the quality, and amount of data.
PLATFORM COMPANY	A single platform operates on behalf of 3rd party applications and billing / fees are operated through this platform.
VOLUME-BASED PRICING	Services are billed based on the amount of data they use, or on how much their service is used through the Kanta PHR.
PRIMARY CONCLUSION FOR VALUE FINACNE	Initial use free for users / data providers, include a fee for service / application providers. Possibility for purchasable services.

7.5 Summary of the results

Based on the results received from the interviews, there are no singular answers on how different value dimensions can be constructed in the case of value creation of well-being data through a national personal health record. Despite no single proposition that can satisfy the dimension primary conclusions can be drawn from each dimension based on the interviews. These primary conclusions can be used to mould a suitable proposition for each dimension that can be applied to value creation for well-being data in a national PHR.

The primary conclusion for the value proposition would be making large amounts of diversified well-being data available for the public and private sector to enhance existing and future processes and services. This proposition combines both conclusions from interviewees from the public and private sector, as the public sector highlighted efficiency through availability and the private sector insights and possibilities of data masses.

The primary conclusion for the value architecture is a mobile and web accessible database for well-being data that allows storage and supports refinement of data. Providing visibility for 3rd party applications with high transparency in user data usage. This conclusion combines the needs of both the public and private sector, by providing a user-friendly solution for data providers (users), for healthcare specialists, and an own environment for application/service providers that makes integration easy.

Value network provided a primary conclusion that for value to be created a different set of entities or actors are needed, for both the public and private sectors. Users providing data, data managers, application/service providers, a PHR provider, legislative authority, and a private sector representative are needed for well-being data to create value through a PHR.

The primary conclusion devised from value finance propositions is a solution that would be free of use for citizens or data providers but has a fee for service and application providers. The application and service use would be chargeable for the users but could be paid for by other entities, such as insurance companies or employers. This conclusion enforces value creation for both the public and private sector. The revenue streams of the service/application providers would be managed through a representing organization, which would manage all commercial applications on the PHR.

The results from the interviews are summarized in TABLE 8. These results are discussed further in chapter 8.

TABLE 8 The value dimensions of well-being data for the Kanta PHR

VALUE DIMENSION	DESCRIPTION	PRIMARY CONCLUSION
VALUE PROPORSITION	How value is created with well-being data	Making large amounts of diversified well-being data available for the public and private sector to enhance existing and future processes and services.
VALUE ARCHITECTURE	Technological architecture and structure supporting value creation with well-being data	Centralized platform for well-being applications. Mobile and Web accessible database for well-being data that allows storage and refinement of data. Providing visibility for 3rd party applications with high transparency in user data usage.
VALUE NETWORK	Stakeholders and actors needed to create value with well-being data	Users/data-providers, application/service-providers, PHR management, Healthcare specialists, Healthcare organizations, platform company, government officials.
VALUE FINANCE	How should the financing be done and how can financial value be created	Initial use free for users / data providers, include a fee for service / application providers. Possibility for purchasable services.

8 DISCUSSION

This chapter will form the discussion part of the study. First the research question will be answered. Secondly the process of how the outcome was determined is discussed and reflected to the literature. After this the chapter will discuss the limitations of the study and address contributions and future research topics.

The research sought to find answers to the research question set at the beginning of this study. The study used literature and an empirical research to determine outcomes for the research question. Not only did the study provide the answer for the pre-determined research question, but it also provided information on different insights on how the outcome and parts of it can be accomplished. The research question this study sought to answer was: *How can well-being data create value through a national personal health record?*

The research sought to answer the research question from the point of view of what is required for well-being data to create value through a national personal health record. The study sought to find the constructs needed to facilitate value creation in the Kanta PHR. Based on the research material gathered in this study it can be determined that value creation is possible with well-being data in a national personal health record. Value can be created in various ways depending on the entity to whom the value is created to, and how the PHR is constructed. Value creation is only possible if the use process of well-being data in this context is planned thoroughly beforehand and all required dimensions are taken into consideration. At the simplest, value can be created by providing the infrastructure to only basic functionalities of a personal health record as in data storage. Yet the results implicate that the greatest benefits or value as a whole is created by providing a platform for different entities to work on in synergy. This platform would facilitate co-creation of value through the government providing basic functionalities and infrastructure, and the data is created by common citizens and users. The data can then be used by both the public and private sector actors, which would create value that radiates out of the PHR. The answer can be viewed from the point of what is needed for value to be created with well-being data in a

national PHR. This can be summed up as providing enhancement to different entities through an easily accessible platform for different users which allows value co-creation by these users, and providing the basis for the public and private sector actors to work in balance by allowing financial constructs to support the needed commercial actors.

The research provided a figure (FIGURE 12) which presents the value dimensions needed for well-being data to create value through the Kanta PHR. The results will be further discussed in the following chapter.

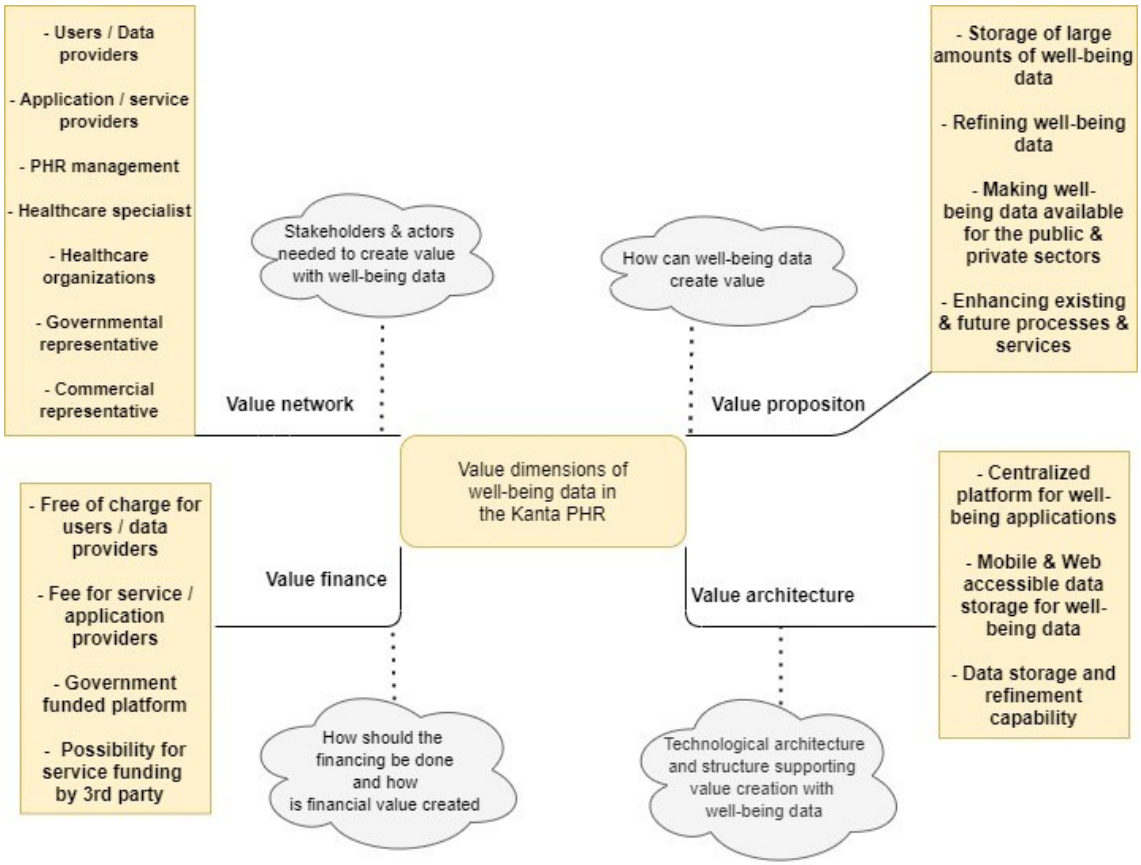

FIGURE 12 Adapted value dimensions for value creation of well-being data in the Kanta PHR

8.1 Value creation of well-being data through a national personal health record

The scientific framework of this study was based on the four value dimensions out of the ontological structure of a business model by Al-Debei & Avison, (2010) applied to the context of personal health records and well-being data. Additionally the six methods for commercial use of big data by Thomas & Leiponen, (2016) were presented to support the research with different models of data use. The used literature is strongly tied to the private sector, but this does not mean that their use in the context of a national project or the public

sector is not possible. The value dimensions should not be viewed from the viewpoints of private or public organizations. This comes from the point that the applicability of the dimensions are not limited by the sectors themselves, but linked with the perception of value the organisation uses. Private sector organisations focus on providing services, and manufacturing products in exchange for monetary compensation. Public organisations operate from a viewpoint of the common good. This means, for example, that services are provided to everyone equally, regardless of their financial background. In this sense the value perception of a public sector organization is tied to the context it operates in. For example, a public hospital does not seek to make monetary profit through its services, but to generate value through cured diseases and ailments. A national personal health record incorporating commercial partners brings a challenge as value creation process includes a wide variety of perceptions of value. With the perception of value in mind, the value dimensions were applied to the context of well-being data in a national personal health record, to find out the needed arrangements to create value as perceived by different entities. This means that the resulting value creation process itself requires interpretation.

As it is mentioned by Al-Debei & Fitzgerald, (2010), the value proposition describes the offerings and the core activities of an organization, while offering its products and services, the value element and target segments. The research viewed this from the point of how value can be created with well-being data in the context of a national PHR. Pre-emptive healthcare as the value proposition seems as one of the most potential propositions and is also widely mentioned in literature as the reason for gathering well-being data in a PHR (Tang et al., 2006). Despite this, pre-emptive healthcare itself cannot be described as single product or service through which value is created but more importantly a result of services and actions that culminate into it. Pre-emptive healthcare can be described as value that is co-created by all participants in the PHR and it can be seen as a goal towards actions are done in the public sector, a process in which the national PHR can assist in. Reflecting to the model by Al-Debei & Avison, (2010) the offering provided by well-being data in a national PHR would be the process enhancement the highly diversified data can offer to different customers or participants. Should the data be enhancement of personal health for a user of the PHR, enhanced patient appointment times for clinicians, a healthier nation requiring less healthcare, or a medical company being able to create more efficient treatments through the data, the perceived value comes from development. Based on this the value element is the gathered or stored data itself. The results indicate that the data is considered as the most valuable element by all interviewed participants even though to provide value for most of the participants the data needs to be enhanced by the PHR itself or another partner. The provided value offering and element indicate that the PHR would need to assume the role of a data supplier, data manager and data custodian, as it would provide, store, and enhance well-being data to be used by others (Klaus, 2011; Schwab et al., 2011; Thomas & Leiponen, 2016). Operating all of

the three roles would require significant financial investments to the PHR, and are thus unlikely regarding the nature of the PHR. As all of the roles cannot be performed solely by the PHR, partners are needed. As such the targeted segments for the value proposition can be considered in being, citizens/users, healthcare specialists from both the public and private sector, and commercial application providers. The citizens would be a part of the value creation process by providing the well-being data, using the services and applications linked to the PHR and by financing a part of it through taxes. Healthcare specialists are part of the value creation process by providing improved diagnoses and care to patients based on the well-being data. Service and application providers contribute to the value creation process by providing applications that help in the procurement of well-being data from users and by providing applications and services through which well-being data can be enhanced to be used by users, healthcare specialist or other partners. For the value proposition of well-being data to work as intended in the proposed context it will need a functioning environment where there are clear constructs and regulations for the participating entities.

As value is fostered through the combination of the value dimensions and as such the proposed value proposition influences the required value architecture. The proposition indicated a need for an architecture which is able to store and refine well-being data, which can then be easily accessed by different users. The proposition also required a design where interaction between the common user and commercial service providers is possible. These requirements were in line with the results gained in the research. Even though the value architecture dimension is described by Al-Debei & Avison, (2010) as the description of the core competencies and resources of an organization, this study used the derived value delivery architecture by Yoo et al., (2010), and refitted it to the context of well-being data in a view that what kind of technical and architectural construct is needed to support value creation of well-being. The results from the research suggested that there is need for an infrastructure that allows the storage of either simple raw data or refined data. This data should be as user friendly as possible and be accessible through both mobile and web devices. Mobile accessibility can be seen as a necessary for the architecture, as majority of well-being data is gathered with wearable devices and transferrable through mobile applications (Gopinathan et al., 2018). As suggested by value proposition and the research data, the architecture should foster co-ordinance with commercial partners and provide visibility to them in a way that users can see all available services and applications. An individual access portal or configuration should be created for professional and non-professional users as the use cases for these user groups differ from each other, and require different features. This implies that the national PHR should be interconnectable, as this allows it to be connected to different healthcare systems (Steele et al., 2012). In the case of the Kanta PHR the architecture can be viewed as a hybrid version of a tethered and interconnected PHR, as it will be connected to different healthcare systems through the Kanta-system (Kela,

2020). As well-being data is sensitive and personal information gathered form private persons, the architecture should emphasise on data privacy and focus on high transparency of data use. Regarding the nature of the case of well-being data in a national PHR, there may be a risk when designing the technical architecture, as it may be created too biased in the way of public healthcare and not provide enough support to the commercial partners it needs to create value. As in the case of the Kanta PHR, the developer is a national institution whose purpose is to provide systems for public, and not for commercial use. Even though the suggested architecture was proposed to be user centered, the balance between different user and operator groups should not be forgotten. For the value architecture of well-being data to be a part of the value creation process it needs to have a clear scope on the network to which the architecture is designed for.

Value creation to be initiated for well-being data, the correct stakeholders are needed. To find the right entities, the research approached this through the view of value network by Al-Debei & Avison, (2010) that describes the element as depicting the inter-organization perspective, in a way in which transactions are enabled through the coordination and collaboration among parties, multiple companies, and stakeholders. To fit the research purpose, the value network dimension was used to figure out the stakeholders and actors needed for well-being data to create value through a national PHR. The value proposition and architecture dimensions of this research are formed on the actors and stakeholders provided by the study, which proves the importance of the stakeholders. The indicated results provided the actors that are needed for a PHR as indicated by (Beinke et al., 2019; Tang et al., 2006) the data providers, PHR-developers, healthcare specialists, governing authorities that provide legislation and commercial partners. The results proposed an additional actor to the concept in the form of a platform organization that would act on behalf of the commercial application providers. This proposal indicated the need for a representative for the commercial partners as the public sector could be seen as acting as a single entity in the proposed solution, but the commercial partners would only be able to act on their own individual behalf. The platform organization would give the commercial partners a more balanced opportunity to influence the development and use of well-being data in a national PHR. The more balanced the different actors are, the stronger the implications for value co-creation are, as every actor has a mutual stake in the process (Vargo et al., 2008). Sharing the development process equally between the commercial and non-commercial partners is difficult, as the development costs in a national project are provided from public funds. This would imply that the public sector has more influence on the development, but as indicated by the value proposition, for the value creation process to function, also commercial partners are needed. For the partnerships to function as required to create value, the distribution of capital needs to be designed in a way that will also foster partnerships towards the private sector.

The aspect of providing a solution for value distribution and the financial constructs for value creation of well-being data in public context proved to be a challenging effort. To find out the financial requirements for value creation of well-being data in a public PHR, the value finance dimension was used. Value finance is described by Al-Debei & Avison (2010), as the way in which organizations manage issues related to costing, pricing and revenue breakdown to sustain and improve its creation of revenue. The dimension was approached form the view of, how can financial value be created and how should the PHR be financed. The construct of a national PHR indicates that it is developed and maintained through public funding. It is also implied that the use of the PHR, and its supplementary services are free of charge for the users, as in the case of the Kanta PHR (Kela, 2020). The challenge of this setup comes from the fact that based on the value proposition, commercial partners are needed to provide applications and services. As the construct of commercial organizations is to create value through the manufacturing of products or services (Vargo & Lusch, 2004), the aspect of providing services for free does not fit this construct. The simple solution would be that the service providers and application developers are funded by the government for work on the well-being data and the PHR. This solution cannot be seen as sustainable in the long run, as service/application development and maintenance is expensive, and could mitigate the benefits of the whole concept. Additionally it is indicated in the literature on PHR, that the more applications and functionalities the PHR has, the more it costs to maintain (Shah et al., 2008). Based on the results received through the research the value finance dimension should be constructed as such that the use of the PHR, importation and management of well-being data should be free for citizens or initial users. The use of healthcare services with well-being data should be financed by the government, as is the case with other healthcare services, in countries that have universal healthcare. Based on the results, the sustainable way for having commercial partners in the PHR would be allowing the service providers and application developers to charge their provided service from the user. The payment for these services could be provided for by the user themselves, by the government as a part of a care plan, by an individual's insurer, or an employer for corporate welfare purposes. This solution would allow for the commercial partners to receive revenue and be a part of the value creation process. The financing for the commercial partners should either be done through competitive bidding or the aforementioned representative platform organization for commercial partners.

These findings suggest that the value creation capabilities of well-being data in a national PHR spring from bringing together motivated stakeholders that are all ready to stretch some of their principles to reach a goal of mutual value creation. The development process of such a project is in no means effortless and will certainly be a project that will succeed only through trial and error. as long as all associated partners are ready to go the long way.

8.2 Limitations of the study

This subchapter will go through the limitations of the study. It will address limitations that have affected the generalizability and reliability of the study and discuss how the impact of the limitations were mitigated. The biggest limitations for this study were the amount of existing literature, the limit of existing cases, the researcher, the nature of the study and the generalizability of the study.

As the particular subject of value creation of well-being data has not been widely researched, the available literature was not sufficient enough to provide a theoretical frame for this thesis. To acquire sufficient and supportive material for the theoretical frame, literature on the topics of value creation, business models, electronic health records and well-being data were studied. By compiling information based on these topics the research was sufficient and of acceptable quality so that a sufficient theoretical frame could be formed.

The case on which the research is conducted is national effort to develop a PHR, which will be available to every Finnish citizen, and still under development. Not many projects of such nature exist and even less have been academically studied, or have been completed. When conducting this research there was no possibility to review how similar projects operate. To mitigate this, a wide variety of interviewees were selected so to provide comprehensive, but quality data on the matter.

Regarding limitations of the researcher relate to the inexperience, personal views, and interests. The empirical research conducted for this study was the first empirical research conducted by the researcher. This inexperience in empirical research can negatively impact the reliability of the study. The matter was mitigated by extensively studying topic related literature, discussing the topic with professionals from the fields related to the topic, and communicating with the thesis supervisor.

When discussing the limitation regarding the generalizability of the study it has to be taken into consideration that this research was conducted as a single case study. The case of this study was the Kanta PHR development project. All the interviewees viewed the interview questions and the subject from the point of view of the Kanta PHR. Based on this it has to be taken into consideration that the results are mostly only applicable to the case of Kanta PHR.

8.3 Contribution and future research

This subchapter will discuss the contributions of this study. Additionally, it will provide practical implications made by the study, and discuss future research topics. As the research was conducted as a single case study, the generalizability of the results is limited. Regardless of this the research has contributed to different fields of study, of well-being data, personal health records, healthcare and to some extent the co-work of public and private sectors.

Previous research on the topic of value and value creation of well-being data focused on the different benefits it brings to healthcare (Frosch et al., 2012; Gao et al., 2015; Raghupathi & Raghupathi, 2014; Thompson et al., 2019).This research extended the view of value of well-being data to encompass not only healthcare, but different stakeholders and services. The provided implications which show that well-being data can create value to commercial organizations.

Well-being data and personal health records have previously been studied based on their technological constructs and what different technological implementations provided to these topics (Beinke et al., 2019; Lane et al., 2011; Steele et al., 2012). The research provided contribution towards the architectural construct of using well-being data and personal health records as, especially in the context of a national project. This was by providing information on what kind of technical architecture suites a national PHR so that it supports value creation.

Research on the financial constructs of personal health records has focused on the financial benefits and financing of the system itself (Shah et al., 2008). This research contributed to the finance aspect by providing information on how a national personal health record provide revenue to commercial partners, how the revenue structure should be constructed, and how it can create financial value overall.

Stakeholders have been studied in the context of personal health records have been studied since PHRs were first studied, and have been an important part of PHR research since (Beinke et al., 2019; Kaelber et al., 2008; Pagliari et al., 2007). This research contributed to the subject by providing information on what stakeholders are needed so that well-being data can create value through a national PHR. In addition, the research provides information on the co-work of both public and private sector actors. This can be seen as contribution towards research on PHR stakeholders, as these sectors usually have different views on value.

In addition to providing scientific contributions, the study provided practical implications. The most viable practical implication of this study is the contribution to the development project of the Kanta PHR. As the project is still under development and waiting for the Finnish legislation to approve the professional use of well-being data there is currently an optimal time to plan

further the stakeholder related operations. The study also provides a possibility for the associates related to the regulation of the PHR to see what professionals from relevant fields think about the project. The results of this study make it possible for different stakeholders of the PHR to plan their involvement, and can give thoughts on the relationships stakeholders should have regarding the PHR.

The conducted research also provided implications for future research. This research focuses on the case of the Finnish national PHR project which is still in development and will not be completed or taken into full use in the very near future. Because of this, future research would be interesting to study how the proposed value elements turn out when the project is completed and the PHR has been taken into full use. Continued from this, as the research was only conducted based on a single case, there is potential for future research to study the provided framework in other national personal health records. Another interesting future research topic would be creating a new, or implementing existing value creation models to national personal health records, and to the element of well-being data. As a part of the results for this study implied the value of well-being data being the possibility of pre-emptive healthcare, potential research could be conducted to research the actual potential of this. Additional potential future research topic would be the implementation of both a platform for applications and services, and of a platform company to personal health record. These platforms would operate on behalf of commercial organizations. The research would study the operation of the platform company and study its potential and feasibility as a solution to facilitate the co-work of the public and private sectors.

9 CONCLUSION

This is the concluding chapter of this study. This study was conducted as a master's thesis which objective was to examine the value creation capabilities of well-being data through a national personal health record. The study was based on case by the Finnish national social security and pension organisations Kanta PHR project. The research area lacks wide scale previous research on the subject and provided a unique setting to study the capabilities of well-being data.

The study consists of a literature review and a qualitative empirical study. The literature review is handled in the chapters 2 to 5. The literature review was conducted to form a theoretical basis for the empirical research and consisted of existing research on the matters of well-being data, personal health records and value creation. Chapter 6 addressed the research methodology used in the study. The chapter discussed the research methodology of qualitative methods, single case studies, the data collection, and data analysis of this this study. Chapter 7 addressed the results from the conducted empirical research. It presented the different elements needed for well-being data to create value through the Kanta PHR. Chapter 8 included the discussion section which addressed the research question and provided a model on the required elements for value creation with well-being data through a national personal health record. The chapter also discussed the findings of the study in relation to the literature. Additionally, the limitations and contributions were discussed, and topics for future research proposed. The final chapter provides the conclusion for the study.

The thesis concludes that value creation with well-being data through a national personal health record is a multisided book as the PHR balances between the benefit of the common user, public sector, and private sector. With coordinated work and effort, it is possible to create value for every participant of the process.

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