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**USER-CENTRIC SERVICE DESIGN IN  
MOBILE HEALTH CARE SERVICES**

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Abstract  <p>The growing age of populations brings widespread problems for a range of services, including health care services. Another challenge is the areas of dispersed settlement and decreasing population in rural areas. Urbanization and movement to the larger cities after employment, education, and services has led to decreasing the services in the remote areas even further. In the changing needs of the requirements and challenges of health care entities the use of mobile health care services may provide many benefits to the systems to develop flexible and adjustable health services to citizens. With the help of mobile health care services, the requirements of ever-changing service needs may be responded more efficiently than traditional onsite health care centers.</p> <p>The purpose of this study is to understand the opportunities of user-centric service design and practices in the design processes of mobile health care services. In the future, mobile health care services may potentially be a medium for implementing the health and social service delivery as one of the standard mediums in order to reduce inconsistencies between habitant areas in Finland. By designing user-centric services with methods that leave room for ongoing development and improvement of mobile health care services.</p> <p>The nature of the study is a qualitative case study. The research phenomenon is approached by semi-structured interviews, to define practicalities in the planning of a mobile health care services. The target group of the interview is particularly chosen participants from representative organizations from both private and public health sector.</p>			

The results of the study confirm the adaptability of user-centric service design in mobile health care services. It also reveals many practical aspects regarding the design process and the possibilities in co-design activities. More precisely, this study suggests that the user of the service can be included in all stages of service design process of mobile health care services in several ways – from defining the need to the implementation and ongoing development. The user-centricity in the context of this study means the users of the service that are involved in the service operations along its way – including employees and other encounters to the service.

The results of the study contributed to the model of service design by assessing its suitability to designing mobile health care services with user-centric approach, and gathering concrete practices of those methods.

Keywords

service design, mobile health care services, user-centricity

Additional information

This study is part of a SOLOG research project at the University of Oulu and Oulu Business School

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## INTRODUCTION

### 1.1 Introduction and justification of the topic

The growing age of populations brings widespread problems for a range of public services, including health and social services around the world (Politt et al, 2007). Another challenge to delivering care to citizens is the areas of dispersed settlement and decreasing population in rural areas. Urbanization and movement to the larger cities after employment, education, and services has led to decreasing the services in the remote areas even further.

In Finland, citizens outside major cities are forced to travel long distances to access health care and other services (Karsisto, 2014). Due to merges of municipalities, the distances are growing even larger. Major services, including health services are being centralized to the larger cities. The government is obligated to maintain a certain level in providing public health care services to the citizens regardless of their residence. It requires new innovations from the service providers to fulfill those requirements.

Long distances are not only affecting the citizens but causing significant costs to the society. A research by Helsingin Sanomat in 2013, the transportation of patients was compensated to citizens for 298 million euros in the previous year (HS 23.01.2013). The number is growing as the demand is growing larger. An ongoing reformation in the industry of health care and social services in Finland is also causing pressure to deliver customer-orientated and good quality services to all areas in the country with a reasonable cost. Securing health care services to rural areas has especially identified as a challenge. One of the solutions to providing the required service need are suggested being mobile health services, a form of health care that delivers care close to the patients' homes offsite from the health centers. (Sirviö et al., 2017.)

A research conducted by The National institute for health and welfare which resulted that the Finnish citizens expect fluency in health care services and an equal accessibility to care (Aalto et al., 2016). Mobile health care services are providing

solutions that increases the access to care by people with geographic, structural and social barriers, therefore decreasing the inequality for the people around the world (Jit et al., 2011; Collinson and Ward, 2010; Morano et al., 2013b; Vyas et al., 2011; Gibson, 2014). The service concept of mobile health care services may be part of a solution in providing equal care to all citizen regardless of their habitual residency also in Finland (Sirviö et al., 2017). According to research, service users of mobile health care services have been generally positive experiences due to customer-centricity of the experiences, good quality of the received services, short waiting times and accessibility of the service. Especially convenient the mobile health care services have been to the individuals that suffer from the complexity of health care systems. (Sirviö et al., 2017.) Efficient and timely access to health care has a profound impact on the well-being of individuals (Bhandari et al., 2012).

In health care, user-centricity means designing services to the existing need of the citizens and moving the emphasis of the development from provider orientation to user orientation. User-orientated services can be produced for example in the means of service design. Today, citizens are becoming more and more motivated in participating in the decision-making activities that involves them and their community. The benefits of user-centricity can be seen both in customer and service producers' employee feedback. User-centricity is stated to be improving both quality and economical aspect of the service, as it can help reduce unnecessary services, overlapping logistics and the services offered will meet the expectations of the customers more efficiently. (Jäppinen & Sallinen 2012; Jäppinen & Nieminen 2014.)

In the changing needs of the requirements and challenges of health care entities the use of mobile health care services may provide many benefits to the systems to develop flexible and adjustable health services to citizens. With the help of mobile health care services, the requirements of ever-changing service needs may be responded more efficiently than traditional onsite health care centers. It offers a wide range of opportunities to the service entity of health care services and enables various innovative development in collaboration with the private and third sector services (Sirviö et al., 2017).

The management of mobile health care services needs to be conducted in a strongly strategic manner (Sirviö et al., 2017). Design thinking has been adopted as an approach to the development of businesses, innovations, public services and recently various of health care services. The growing complexity of the previously hierarchical health care industry has led to examination of service design in the industry and various research on the matter (see i.e. Freire & Sangiorgi, 2010; Alhonsuo et al., 2017). Central to such redesign initiatives is the idea that services should be designed more around the needs of the customers' than around professional's interests (McNulty & Ferlie, 2002; Powell & Davies, 2001; Hyde, 2004).

Service design is stated to be beneficial when developing health care services because of its human-centered approach, which is considered ideal for sensitive subjects. Service design can make sense of complex, multi-level processes in health care, while bringing people together in a co-design atmosphere. As a participatory approach, service design provides tools to start a conversation about personal experiences and creates an environment for open communication. (Alhonsuo, 2016.)

The purpose of this study is to understand the opportunities of user-centric service design and practices in the design processes of mobile health care services. In the future, mobile health care services may potentially be a medium for implementing the health and social service delivery as one of the standard mediums in order to reduce inconsistencies between habitant areas in Finland. By designing user-centric services with methods that leave room for ongoing development and improvement of mobile health care services. Further justification for the theoretical framework of service design and design thinking can be read in chapter two of this study.

## 1.2 Purpose of research and research questions

The purpose of this study is to advance knowledge in opportunities for user-centric service design in the context of mobile health care services. Mobile health care services have been adopted in many institutions in Finland, yet research focused on those services is minor excluding some projects and reports that have been conducted around them (see i.g. Immonen et al., 2012; Sirviö & Äijö, 2012; Järvi et al., 2013; Meinilä, 2014). The project overviews are widely focused on the accessibility to services for



the elderly and cooperating with educational institutions in providing mobile health care to citizens. In some surveys of the mobile health care services, customer experience of the service users have been reported (i.e. Immonen et al., 2012; Äijö & Sirviö, 2013; Länsman & Sulila, 2014). The general feedback from the service users on the mobile health care services has been positive (Sirviö et al., 2017).

Internationally, service design has been examined in research in the health care industry and has recently been adopted to the mobile health care systems as digital services and health care mobile applications and other digital platforms. Research on service design in mobile health care units so far are little or non-existent. In Finland, Karsisto (2014) has conducted a Master's Thesis on mobile health care services, where service design is a small part of his study, yet the research is mainly based on the industrial design of the service.

International research show that mobile health care services can be beneficial in various purposes. The opportunities are adjustable and they fit in various different customer segments in health care. To be able to provide similar solutions in Finland as a part of the health care services effectively, further research and knowledge on the development opportunities of mobile health care services needs to be conducted. (Sirviö et al., 2017.)

In order design the processes in the mobile health care service to meet the user requirements and expectations, it can be beneficial for both the service provider and the citizen. To discover potential practices for the design process of mobile health care services, this study aims to understand the opportunities of user-centric service design and implement those findings in the design processes of mobile health care services. In addition, empirical examples of such practices are collected.

The study does not limit the focus on either the public or private services as it is not seen as necessary in terms of determine the ideal solutions for service providers. The outcome of this study aims to be beneficial for both public and private sector operators in mobile health care service industry.

The research is approached by the primary research question:

*How to design user-centric mobile health care services through service design framework?*

The supporting sub-questions to comprehend the learnings of the study are:

*What are the core stages of service design process?*

*How to include the user in the design process of mobile health care services?*

### 1.3 Research methodology

The nature of this study is a qualitative case study. By semi-structured interviews, the study aspires to find practicalities in the planning of a mobile health care services. The target group of the interview is particularly chosen participants from representative organizations from both private and public health sector. The methodology of the study with data collection and analysis is discussed further in chapter five.

### 1.4 Definition of the key terms

#### Service design

Service design is an evolving field of study that consists of designing services with design orientated methods (Maffei et al., 2005; Mager, 2009) where the user of the service is in a key role in the designing process (Maffei et al, 2005; Nerur & Balijepally, 2007; Moritz, 2005; Sauvola et al., 2016).

#### Mobile health care service

Mobile healthcare clinics are an alternative solution to delivering care to people with transportable healthcare units that enable healthcare offsite from institutions and healthcare agencies to underserved populations that might be difficult to reach (Guruge et al. 2009). The services provided with the moving vehicles can also be called *mobile health clinics* or other similar setting. The mobile health care service in the context of

this study means the delivery of transportable care with a vehicle and covers all alternatives in that area.

### User-centricity

User-centricity is a mean of designing services to the existing need of the citizens and moving the emphasis of the development from provider orientation to user orientation (Jäppinen & Sallinen 2012; Jäppinen & Nieminen 2014).

### Customer

Although the term *patient* is widely used in the health care context, the more appropriate term in marketing and business research is the term *customer*, when addressing the end-user of the service. In this study, the use of *customer* represents the patient, service user, buyer, end-user and the consumer of the service. Sometimes, *citizen* is used in the research to express a population that is not in the immediate need of care, but a population which services needs to be delivered to. As an exception, in some occasions of the study, *patient* is used if the context requires it for clarity.

### User

Unlike in some contexts, where the term *user* simply indicates the customer of the service, this study, uses *user* or *service user* to express all potential users involved in the service process including management, employees, designers and also customers of the service.

## 1.5 Research structure

The study consists of seven chapters. The introducing chapter provides the reader an insight of the context and relevance of the study and presents the required research questions to draw focus for the subject. Methodology is also discussed shortly in the introduction chapter and more precisely in chapter five. After introduction, framework of service design is presented with sufficient depth to provide understanding to the phenomena studied in this work and a brief discussion of the role of design thinking

in health care is followed. The theoretical concept of mobile health care as a context is addressed after service design with some management related issues for extra value for the literature review. Chapter four summarizes the aforementioned aspects to a suggested theoretical framework. After the fifth chapter, the empirical introduction and research with deeper analysis follows, which leads to concluding chapter with managerial implications and suggestions for future research which is drawn based on the analysis. The results will also be observed in a critical manner in the concluding chapter.

## 2 SERVICE DESIGN

### 2.1 Principles of service design

Service design is an evolving field of study that consists of designing services with design orientated methods (Maffei et al., 2005; Mager, 2009) where the user of the service is in a key role in the designing process (Maffei et al, 2005; Nerur & Balijepally, 2007; Moritz, 2005; Sauvola et al., 2016). Service design methods are observing functions of the interfaces of a service from the service user's perspective and aims to ensure that the wholeness is both useful and desirable (Mager, 2009; Moritz, 2005; Stickdorn & Schneider, 2012). It extends the definition of design from product centricity to holistic planning of the systems, processes and experiences of a service (Maffei et al, 2005; Moritz, 2005; Nerur & Balijepally, 2007).

The service design thinking emphasis strong social skills and empathy towards users of the service. The concepts, solution and experiences are designed for the users, not service providers. The designers work together to coordinate the design developments between the stakeholders of the service throughout the process. Designers are especially trained to see the systems from the perspectives of the users. The design orientation or design thinking has been discussed as a medium of giving strategic direction. (Miettinen, 2009.)

Implementation of service design requires understanding of the existing market, the customer and the organization, to ensure ongoing development opportunities and a lasting life-cycle for the service. The service design outcomes should respond to needs and requirements of an organization and transform into business practicalities (Moritz, 2005). The aim is to observe the entire customer journey before, during and after the service in order to design the process fluently and support goals of both the customers and the service providers (Nerur & Balijepally, 2007).

By designing adaptable services with service design, they can be adjusted more effortlessly to changing situations and needs and developed further in the future. It is more of a process than anything else, and during that process it is an ongoing cycle of design, testing and redesigning (Miettinen et. al, 2014). Simplifying complex

experiences and modifying them by a certain design it is possible to fulfill the needs of the customer more efficiently. As a result, it will be more effective in the management of resources, such as human, capital and natural ones. (Polaine, 2012.)

The practices of service design have been applied to number of fields around service industries, such as transport, banking, education, retail and health, including public and social services. Businesses world-wide have started to recognize the potentials service design has to offer for their services and the number of investments is increasing in the design and development research, when new roles and departments are created to serve these aspects for the benefit of the service offerings of a company. According to Mager (2009), the more innovative and successful the company is, the more likely it is for it to be adopting this paradigm amongst the first. (Mager 2009.)

The methods and ideology in service design are recommended to be connected to the decision-making processes to enable the possibilities from theory to practices. (Jäppinen & Sorsimo, 2014.) It may mean resources from the management and acknowledgements of service design in regards to operations within the organization. By investigating design processes more closely, it can be possible to draw common elements and general principles that are transportable and discussable (Pollitt et al., 2007).

### **Service design processes**

Design is a creative process and cannot be fitted in single formula. However, ‘*best practises*’ can be identified and frameworks created according to them (Pollitt et al., 2007). Methods commonly used in service design are mediums to understand the customers and consumers, their expectations, the market and resource requirements across the touchpoints of the service (Moritz, 2005; Tuulaniemi, 2011). Touchpoints of a service represent the surfaces that the users of the service go through when using the service, and they are designed to direct the user experience in the right direction. It can consist of interfaces such as phone service, personal interactions and communication, social media, service venues, prints and brochures, equipment, and any physical components that interconnect with the service user. (Sauvola et. al., 2016.)

According to Tuulaniemi (2011) service design as a process can be divided in five steps; definition, research, design, production and evaluation. Moritz (2005) suggests that service design is a process across four D's – discovering, defining, developing and delivering. Many suggestions are provided in literature. The similarities of suggestions of the researchers studied is the defining the need or an idea of a product or service before design, and prototyping or testing the design before implementation. An ongoing, circular method is often suggested, emphasizing that the process does not finish at implementation but is more of an ongoing development of the service with the service design philosophy. (Moritz, 2005; Van Oosterom, 2009; Mager, 2009; Tuulaniemi, 2011; Miettinen et. al. 2014.)

The design process itself for services should always be starting from the need for the service. According to Pollitt et al., (2007), initiatives for changes are often not expected from the middle or lower employees, and generally aren't welcome. The assumption is, that changes are coming from the top of the organization and therefore will be implemented in the strategy of that organization. The outside suggestions are ranked to be in the bottom in terms of receptance, and will not be addressed at all. The responsibility is on the managers to create supportive attitude towards suggestions and ideas for improvement. In the case study reported in 2007, Pollitt et al. found that simple feedback collection was a medium which informed the case organization of development needs. (Pollitt, 2007.)

Regardless of the concept of design target, an early search on others have done by using references in the sector or outside, and in or out of the operating country. It means the observation of other service providers and their services to learn from the best practicalities and redesign those further for personal, customized purposes. (Pollitt, 2007).

### **Measuring service design**

The measurement of the performance as value in service design equals the measurement of value of the service. According to Miettinen et al. (2014), the service design approach should measure the performance of the service experience throughout the customer journey and touchpoints of the service. The measurement simply answers

the question of how well the service is performing. It can be divided in two measurement categories – inward and outward facing measurement. The inward facing value measurement is indicating how the value is delivered to the organization that is providing the service. For instance, how cost effective the service is for the company. (Miettinen et al. 2014.)

The outward facing measures the results for the service user, also known as customer satisfactory. The performance measurement is called cold & hard metrics of the business whereas service designers are more focusing on the aspects and experiences of the service users and the people using them. The performance measurements are useful for the service design creation and experience design. (Polaine et. al, 2013.) According to Pollitt (2007), the design process and innovations should always be evaluated and a wide spectrum of views is ideal to the development and that the *“evaluation is not just for the managers”*.

Working with experiences to service design is important. The current and future experiences of all users is the context in which service design works. Services should be offering positive experiences by ensuring that they meet or exceed the users’ expectations. (Polaine et. al, 2013)

To ensure a long life-cycle and high quality in services, service providers should invest in strategies of participation and knowledge on needs and performance. It means that the service provider must change their perspective from organization-centered to networking and change focus from internal to external output and outcome participating the stakeholders and citizens in every stage of the service design, and measure those experiences throughout. (Politt et al., 2007.)

## 2.2 User-centric design

User-centric design aims to emphasize and understand the user of the service, the service context, and the service environment from the user’s perspective to ensure a meaningful service solutions (Keinonen & Jääskö 2003). User-centered designers engage actively with customers to gather insights that drive design from the earliest stages of product and service development, throughout the design processes.



## Co-design

Co-design is strongly highlighted in the field of service design, and it refers to the process in which users and stakeholders are involved as producers of the design tasks. The service users are not seen as only feedback informants but as active designing participants from the beginning to the end of the design process. They might be included as targets of qualitative methods in forms of interviews and observation, or they can be asked to produce data by using self-documentation methods such as design probes. Workshops are often included in the process, and they typically include collaborative prototyping as a medium of expressing the information. (Sauvola et. al., 2016.) The design process and the final solution is hosted and implemented by the professionals (Sauvola et. al., 2016; Freire & Sangiorgi, 2010). Co-design in for example, healthcare services, implies a partnership between patients, professionals and community working together in the design (development) process (Sanders & Stappers, 2008).

The actors included in the design process can be either citizens in general, or potential customers as individuals representing their occupation or sociological status, for instance as parents. Including organizations in the design process is possible and can be of a third sector or private sector. The involvement can be either permanent or temporary. (Pollitt et al. 2007)

Politt et al. (2007) state that it is crucial to be stop to observe qualities of outputs and outcomes to maintain the right direction. They emphasize that the involvement of the stakeholders, particularly service users and citizens are fundamental in each phase of the cycle of the service. Their cycle of service contains the design of service, its decision, production and importantly, evaluations. It is acknowledged, that the theoretical phases are not always proceeding in the planned way in practice. Experiences in evaluation can lead back to making changes in the design, and some findings can have an effect on all stages. What is important, is the commitment of stakeholders in each decision process, that occur in all phases of the service cycle. (Politt et al., 2007.)

## Prototyping

Experience prototyping is one of the key methods in user-centric co-design, serving as an efficient medium for concretizing the customer insight. The purpose of experience prototyping is to represent and test different design concepts and ideas in practice. Prototypes are defined as the representations of a design made before final service exist. It makes it possible for designers, customers and service users to reach a common understanding of the forthcoming results of the ongoing project.

There are a number of methods developed to enhance the implementation of prototyping (Sauvola et al., 2016). Experience prototyping has three roles in the design process; understanding customer insight findings, exploring new ideas, and communicating concepts to others (Buchenau & Fulton, 2000; Sauvola et al., 2016.) Service prototyping can add valuable insight into the service design process from the customers and help evaluating the service concepts. In technology-orientated prototyping, the purpose is to focus the prototyping on the touch points, service moments, service paths and customer journeys of the service. Together these two prototyping methods can be an efficient way to create different scenarios for testing the created service and developing them further (Miettinen & Kuure, 2013; Miettinen et al, 2014).

### 2.3 Design thinking in health care

The value-creation model in health care, has shifted from the traditional serial and centralized chain to open end and paradigms, where the customers of the services are co-creating their own wellbeing. The mass production model of healthcare is the traditional model where illnesses and diseases are treated by experts, such as doctors, with their specialized knowledge and is considered an efficient approach. The mass-customization is a model which delivers a much more personalized healthcare services and is a later form of the aforementioned mass-production model. The mass-customization is a related to the phenomena where public health care sectors started to implement and apply market research techniques to have a better understanding of their customers. (Freire & Sangiorgi, 2010.)

The health care industry is one of the fastest growing areas in the service economy and service quality has become a critical element of strategy for health care organizations (Andaleeb, 2001). Design thinking has brought fresh perspective to the development of user-centric (public) services. Useful practices are most often results of understanding the users of the services throughout and observing the operations of the service with the service design methods. The design thinking can be extended to the strategies and decision making of (public) services to move the focus from operations-centricity to understanding the user of the service. (Jäppinen & Sorsimo, 2014.)

Service design is stated to be beneficial when developing health care services because of its human-centered approach, which is considered ideal for sensitive subjects. Service design can make sense of complex, multi-level processes in health care, while bringing people together in a co-design atmosphere. As a participatory approach, service design provides tools to start a conversation about personal experiences and creates an environment for open communication. Visualizing working processes are effective for pointing out gaps and lacks in communication and missing links within stakeholders. Visualized processes also work as a platform for further development. (Alhonsuo, 2016.)

There are number of issues to consider when designing efficient processes for healthcare professionals or better healthcare services for customers because of the complexity, diverse processes are challenging to design. The service design approach applies process-based models that use design tools to make things less complex and more understandable. It also conducts the co-design methods, the creating and developing existing or new services with users, as well as concrete prototypes to clarify the processes and ideas (Kimbell, 2009; Segelström, 2009; Alhonsuo, 2016).

In health care, user-centricity means designing services to the existing need of the citizens and moving the emphasis of the development from provider orientation to user orientation. User-orientated services can be produced in the means of service design. Today, citizens are becoming more and more motivated in participating in the decision-making activities that involves them and their community. The benefits of user-centricity can be seen both in customer and service producers' employee feedback. User-centricity is stated to be improving both quality and economical aspect

of the service, as it can help reduce unnecessary services and the services offered will meet the expectations of the customers more efficiently. (Jäppinen & Sallinen 2012; Jäppinen & Nieminen 2014.)

One of the main obstacles in service design in health care innovations is the deeply rooted model of patient-doctor relationship, which is preventing the bigger reformations in the norms of the industry (Shove, 2003; Freire & Sangiorgi, 2010). Working against the pre-assumptions of traditional health care solutions, one can design a more sustainable and radical modification (Freire & Sangiorgi, 2010). A trend in a greater recognition is the realization that patients and other service users need to be more actively involved in their own care (Kendall, 2003). This conception expects that service users will contribute, through redesign of organizational structures and processes, to the production and design of their own care (Hyde & Davies, 2004).

### 3 MOBILE HEALTH CARE SERVICES

#### 3.1 Mobile health care services – an alternative solution

Mobile service is a concept that means a service or a part of a service entity being delivered to the customer in the medium of a transportable platform, i.e. a vehicle to deliver it as close as possible to the customer's home (Immonen et al., 2012). The mobile service does not have to necessarily be its own service content, but it can be a fracture of a larger network of services in more ways than just delivering service equipment or materials. Interactivity in the process between mobile and onsite services is something that has been neglected in the Finnish models (Lehtola, 2008; Immonen et al., 2012).

*Mobile health care* (Caires, 2017) or *Mobile health clinics* (Guruge et al., 2009; Gibson, 2014; Kojima, 2017) represent transportable healthcare and can also be called *Mobile medical clinics* or *Mobile clinics* (Lafuente et al., 2007; Pitt et al., 2012). Mobile health care can also be understood in some cases as wireless communications solutions such as health care applications in mobile phones and other wireless interfaces (Mangu, 2017). *The mobility of health care professionals* on the other hand means the movement of the doctors and other health care occupants to provide the demand of health care services (Ribeiro, 2014).

Mobile healthcare clinics are an alternative solution to delivering care to people with transportable healthcare units that enable healthcare offsite from institutions and healthcare agencies to underserved populations that might be difficult to reach (Guruge et al. 2009). They are healthcare strategies that increase the access to care by people with geographic, structural and social barriers, therefore decreasing the inequality for the marginal groups by implementing the traditional, fixed healthcare mediums of healthcare (Jit et al., 2011; Collinson and Ward, 2010; Morano et al., 2013b; Schwarz et al., 2009; Vyas et al., 2011; Gibson, 2014). Mobile healthcare clinics make it possible to deliver healthcare at a reasonable distance of groups that are restricted by location (Leese et al., 1993; Sarnquist et al., 2011; Gibson, 2014) or other obstacles such as limited access to transportation (Hastings et al., 2007; Shannon et al., 2008; Collinson and Ward, 2010; Gibson, 2014). They are sometimes described as non-

traditional health care strategies. (Gibson, 2014.) Study finds that mobile medical clinics have been successful especially in delivering services to rural (Peritogiannis et al., 2011; Sarnquist et al., 2011) and urban minorities (Daiski, 2005). Mobile healthcare can also be favorable for the populations that are vulnerable due to poor traditional healthcare. (Gibson, 2014.)

A literature view by Guruge et al. (2009) reveals that mobile health care has been implemented for a large variety range of health-related services, including the increase of access to services for the elderly living in rural areas, screening at-risk-populations such as drug-users and the homeless, providing maternal health care services, screening for sexually transmitted infections, preventive health care such as dental care, screening for breast and/or cervical cancers and providing crisis care for mental illness. (Guruge et al. 2009.) Mobile health clinics can be a sufficient way of delivering health care, health promotion and education. They have a tendency of using fewer operators for larger areas in comparison to traditional health care centers, which is extremely practical in areas where the geographical distribution of patients is widespread. (Kojima et al., 2017.)

According to Pitt et al. (2012), there is strong evidence that mobile clinics that provide relatively skilled services even on intermittent basis can make a helpful influence with preventing activities such as health counselling, vaccinations, hygiene services and education. Also, specific curative services for chronic diseases have a positive health impact, according to the research. A mobile service chain can be beneficial where the service providers are widespread and also sum up to overlapping logistics. It can also play a part as complementing variety of fixed services by adding to them. Ideally, they can provide and deliver services to places where people tend to go on daily places, such as stores at a certain hour. (Immonen et al., 2012.)

### 3.2 Managing mobile health care services

The management of multi-staged, multi-operative and interdisciplinary design and development has been studied to be in major role in development of the mobile health care services. A starting point in the design process should always be the need of the

customer and defining that need. It ensures the continuum and utilization rate if the service. (Sirviö et al. 2017.)

The approachable health care personnel, personal encounter and customer-centricity are studied to be in key in positive experiences in research by Daiski (2005). A study by Sirviö et al. (2017) declared experiences and views on the benefits of mobile health care services and requirements for their development, and also challenges in the designers, managers and employees of the service. The research also issued the importance of the user-centricity in the design process of the service, declaring the need for the service in order to design those services and ongoing, user-centric development. The study also highlighted the importance of the feedback gathering and follow-up of the service. (Sirviö et al. 2017.)

#### **4 USER-CENTRIC SERVICE DESIGN IN MOBILE HEALTH CARE SERVICES**

Studies show that mobile health care services can be implemented in numerous of health-related services and delivered to areas where the need is present. They are an alternative solution to delivering care for people who might not be able to access it without sacrificing personal resources. (Leese et al., 1993; Guruge et al., 2009; Sarnquist et al., 2011; Gibson, 2014.) Designing affluent mobile health care services, they are not only fertile to the service provider but the minorities that are in need.

One of the central suggestions in the framework of service design is the participation of the user in the design processes and it is often emphasized that they should not only be included but in a key role (Maffei et al, 2005; Nerur & Balijepally, 2007; Moritz, 2005; Sauvola et al., 2016). The result of the aforementioned method is that the service implemented will ensure that the wholeness is functional and desirable in all levels (Mager, 2009; Moritz, 2005; Stickdorn & Schneider, 2012). Goals of both service provider and the customer of the service will likely fulfill (Nerur & Balijepally, 2007).

The service design thinking emphasis strong social skills and empathy towards users of the service. Service design in health care underlines the participation of not just the customer but users and other stakeholders in the design process (Jäppinen & Sallinen 2012; Jäppinen & Nieminen 2014). The stakeholders may consist of both internal and external operators (Moritz, 2005; Vaajakallio & Mattelmäki, 2011; Miettinen et. al., 2014) and interdisciplinary is common in the value creation (Vaajakallio & Mattelmäki, 2011). Experience prototyping is the medium for concretizing the customer and user insight. It should be practiced before implementing the service and it provides many benefits, including development of the service and testing the validation of the service. (Sauvola et al., 2016; Buchenau & Fulton, 2000; Pinheiro, 2014; Sauvola et. al., 2016.)

Many suggestions for the design process and its stages are provided in literature. The similarities of suggestions of the researchers studied is the defining the need or an idea for the service before design and prototyping or testing the design before implementation. An ongoing, circular method is often suggested, emphasizing that the



process does not finish at implementation but is more of an ongoing development of the service with the service design philosophy. (Moritz, 2005; Van Oosterom, 2009; Mager, 2009; Tuulaniemi, 2011; Miettinen et. al. 2014.) Implementation of service design requires understanding of the existing market, the customer and the organization to ensure ongoing development opportunities and a lasting life-cycle for the service. A starting point in the design process should always be the need of the customer and defining that need. It ensures the continuum and utilization rate if the service (Sirviö et al. 2017).

The benefits of user-centricity can be seen both in customer and service producers' employee feedback. It is also stated to be improving both quality and profitability aspect of the service, as it can help reduce unnecessary services and the services offered will meet the expectations of the customers more efficiently. (Jäppinen & Sallinen 2012; Jäppinen & Nieminen 2014.) To ensure a long life-cycle and high quality in services, service providers should invest in strategies of participation and knowledge on needs and performance. It means that the service provider must change their perspective from organization-centered to networking and change focus from internal to external output and measure the user experiences throughout. (Politt et al., 2007.)

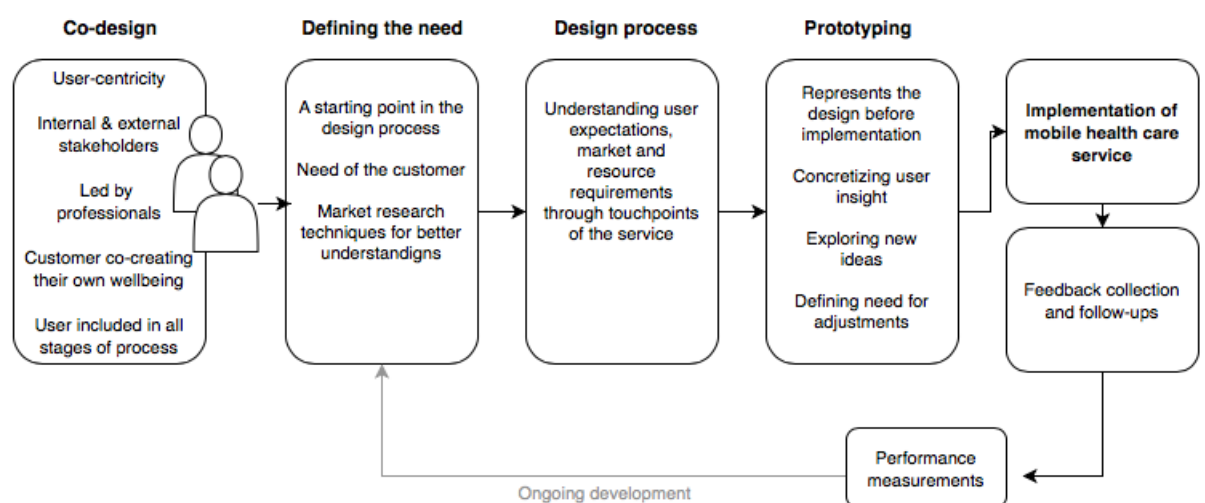


Figure 1 User-centric service design in a mobile health care service

## 5 RESEARCH DESIGN

### 5.1 Research methodology

The research is a qualitative in nature, which is suitable for studying processes where data collection, analysis and action are placed simultaneously (Gummerson, 2000). The characteristics of qualitative study, such as inductive logic, hypotheses drawn from single cases and understanding the relationships between existing knowledge support the nature of qualitative study in this research. (Koskinen et al., 2005.)

This study uses semi-structured interviews as a method for collecting data. The interview as a method is considered suitable for the nature of the research as the interest of the study was to declare views and experiences of the mobile health care services (Hirsjärvi & Hurme, 2010). The thematic structure of the interviews are pre-planned and based on the goals of the study (Hoskins & Mariano, 2004). The themes are based on the theoretical framework summarized in chapter four to discover the experiences and actions related to those service design operations.

This study is a case study, which is usually one or few cases that are selected for a thorough examination. It is one of the most common methods used in academic business research (Koskinen et al., 2005). The interviews were agreed most often via email conversations and the interviews themselves were done on the phone and recorded with a recording device. The interview lengths varied from twenty minutes to almost an hour per interview. The question structure was sent to the informants prior upon request, to save time in the interview situation. The records were transcript and categorized afterwards. The nature of the interviews was highly dependent on the time and interest of the participating informant and the scale they shared their insights. Different aspects in the interview that raised interest of the researcher, that were less common, were discussed further and further questions were asked.

### 5.2 Data collection and analysis method

The data collected for this study was done using semi-structured interviews of service providers' representatives to understand the research context. All the interviews were

conducted in Finnish and more detailed information is in Table 2. The interviews were carried via phone calls due to long distances between the researcher and the informants.

The data has been gathered by interviewing representatives of mobile health care services that are involved in existing operations. The focus group is consistent of both managerial level and employees to get insight from both perspectives. The existing service providers of mobile health care services were explored to list the existing health care services and each operator was contacted. The result in interviewed service providers' presentatives represents the number of interviews that were successfully scheduled with those whom were interested in participating to the research.

The informants were asked to describe different stages of the service from need definition to implementing the service and current methods for performance measurements. User participation was inquired. The aim of the interviews was to ask thematic questions and let the respondents share their insights freely. Some specified, further questions were made about topics to learn more. The structure of the question pattern followed the themes of service design framework to learn how those were implemented in practice by the informants. The interviews were recorded and transcript afterwards. Some of the informants are managers in their that also performed in the operational duties, they are marked as *Duty managers*.

Having conducted the semi-structured interviews, the responses were categorized under thematics of service design and analyzed according to the theoretic framework presented in previous chapters.

**Table 1. Interview Information**

<b>Interviewee(s)</b>	<b>Organisation</b>	<b>Date</b>	<b>Lenght</b>
Employee	Public health care organization	18.3.2019	50min
Duty manager	Private health care organization	18.3.2019	46min
Duty manager	Private health care organization	19.3.2019	25min
Service manager	Private health care organization	26.3.2019	20min
Service manager	Public health care organization	28.3.2019	47min
Project manager	Public health care organization	28.3.2019	33min

## **6 EMPIRICAL RESEARCH ON SERVICE DESIGN ACTIVITIES IN DESIGNING MOBILE HEALTH CARE SERVICES**

### **6.1 Service design activities in the design processes of mobile health care services**

The categorization of the empirical data is based on Figure 1. in chapter four, a result of findings in the frameworks examined in service design and supporting literature. The overview of data is in form of a thematic transcript, which narrates the data from the interviews. No direct quotations are included in form of citations as the data narrates under the themes are described in a summarizing medium and therefore would provide no extra value to the data nor the research.

#### **Defining the need for the service**

Some informants described an individual survey project in collaboration with several institutions that was conducted to examine the need for a mobile health care service. One of the aims was to offer public health services to remote areas with fewer populations and that along start replacing health centers with the mobile service.

Another information source for defining the need of a mobile health service was particular publications of the Ministry of social affairs and health and research on how services are decreasing in remote areas together with the findings of the benefits of mobile health services and digital services. The publications gave justification to the organization to start planning mobile services in the area.

One of the services of the informants conducted an individual survey project for the purpose of defining the need for the mobile health service which lasted for a certain time and started the process of the implementation of the mobile health clinic. In the survey project, the backgrounds for the need for the service were studied in terms of geographic distribution and the age structure of the population in the target area

The definition for need of a mobile health care service was discovered through an operating health care service, also a mobile one, that had limited resources and therefore led to launching an additional one. An internal need was discovered

according to the distances between services of a company, and lack of onsite health centers in smaller municipalities which meant that the company had to transfer patients between the facilities, which again was not profitable.

Estimations were made in order to define whether it is justified to start the new service or not. One of the causes for the problem was the fact that all of the locations did not have the service but it had to be offered from another town. According to the findings of the operator, there was a need for the service in the smaller locations as well and the company did not want to lose any more customers. The informant describes that there was often also a scenario that the service was provided outside the business and results brought to the referral company, and the quality of the competitors did not meet the expectations and caused difficulties for the company.

In a public sector, it was noticed that the elderly had difficulties of leaving for services and parents spent a lot of time transporting their children to health care. According to an informant, the information of a need was received from the citizens of the municipality and people living in remote areas.

Another channel for the definition of need was through an informant's own profession, where they faced the lack of resources for a service in Finland and developed a whole new concept of a moving vehicle providing this service based on their empirical observations and discussions with professionals in the industry.

One of the private sector operators discovered the need by the executives of a company when they found that they are not receiving as many customers as they would ideally long for. They had given referrals for treatment for customers which ended up going to a competitor for the follow-up treatment. An idea for a mobile health care service in another organization also came from the executive that was certain that there is a demand to study the need further.

### **Service design process & methods**

Some of the mediums of design were described as softwares that mapped locations where the service is optimal to use. Those softwares are still in use in the organization.

Workshops were conducted. Some of the touchpoints designed were timetables of the service, the content, and variety of the services. The emphasis of the workshops was on providing the possibility to have all kinds of suggestions, and no limits were drawn to the variety of ideas in planning the possibilities of the service. In practice, the participants involved in the design process were divided into randomly assigned groups of about five people, so that each group most likely consisted of any age groups and professions and occupations. The ideas were written on paper and collected after for general discussion, where new ideas evolved even further. According to the informant, these workshops were extremely fertile to the project.

Thematic days were organized with playful activities. Those events were well-received and caught positive feedback.

One service provider clarified that they used both customer workshops with visual methods and both traditional surveys and interviews. The visual methods were conducted by service design students of a partnering institution.

Also, similar, existing mobile health care services organized by other organizations were observed as examples and those were visited in their place of operation.

Some examples of mobile health services from other countries were researched and observed and it gave the service designers the conclusion that the vehicle they will implement shall be smaller than a truck so that anyone can drive it. This particular organization did participate some technical professionals in the design process to collect information regarding the computer technology in the service and observed some examples from other countries to develop a similar service to Finland.

### **Prototyping**

Almost all of the informants stated the service has not been tested before implementing it. A few arguments for this were that there was no need to test the service, the service was straightforward as it is, and that there was no time for testing the service before launching it. Another statement was that the service had been used in another location by another company, so the testing was not necessary. According to one informant,

the training of employees to use the facilities of the mobile health care service was the only testing needed for the service.

Only one of the informants did state however that they tested the service with students and elderly before implementation. Several surveys were also made by some co-operating institutions and educational thesis's were conducted according those occasions. The service efficiency of the employees was also studied by asking them and how they experienced the service in relation to onsite operations.

### **Including users in the design activities**

Certain service that was launched in addition to an existing one of the same operator, was used to gather information from citizens by collecting surveys for businesses, educational institutions and associations and professionals to find out what services could be implemented in the new concept. The customers of that old service were also interviewed to find out what services they would like to have.

The project group of the mobile health care service, the presentatives interviewed the research group to determine whether mobile services could be conducted in the area and existing mobile health care services were visited.

One of the services showed a great amount of including the customer of the service in the design process of the service. According to the informant, public customer forum events were held frequently to gather people of all ages and occupation to plan, design and compose the services.

Customer workshops with visual methods and interviews were collected by a service provider, for example workshops amongst elderly and interviewing children at schools. Also, mentally disabled youngsters and young adults were heard and the information gathered was used to create different scenarios from the service design students.

It was emphasized that it has been extremely important to include the customer in the design process from the very beginning. The variety of ages and occupations, for



example people in and outside of working life provided many different aspects to the process.

Some service providers visited municipalities that had mobile health services and interviewed their employees and conducted interviews to their potential customers.

Some meetings and development days were held monthly, and the phase at the beginning was rather intense and the planning group was consistent of numerous people. Through time the group was downsized to the certain people. There was an assigned team for familiarizing with the existing mobile services and the team also consisted of drivers and technical professionals.

This particular organization did participate some technical professionals in the design process to collect information regarding the computer technology in the service and observed some examples from other countries to develop a similar service to Finland.

After familiarizing with the existing services, the team made decisions on the procuring of the vehicle and the future driver of the service was included in all stages of the planning. From the ambulance industry professionals provided their insight on the body of the car and how it is suitable to the traffic in the countryside.

When another organization was planning the implementation of their service innovation, the designers only participated the customer in the process after the service was ready. The aim in the meetings with the customers did not affect on the results of the service, only the implementation with that particular facet when selling the service for them. According to the informant, this was due to launching such an innovation at that time that no-one had the experience for it, especially the customer. Also the representatives of the future operative employees were always included. No customers were involved in these processes but some of the employees acted as customer insight to provide those aspects, it was described as efficient. According to the informant, they provided valuable insight on what could be improved in regards to their own work.

According to the informant, the service was so successful because the professionals from different professions were co-designing the services in-stead of individually

working on them. Also, the fact that the designing group maintained the same for the whole time of the project was helpful.

It was emphasized that the designers of individual components such as the cabinets in vehicles was always designed and planned together with other participants of the design process. One of the core-operators was always involved in all touchpoints and their design.

One informant stated that the management of the organization was in crucial role in regards to the planning process included implementing surveys about where the services are needed most, which was strongly involved in the process.

It was emphasized that it was extremely important to include the customer in the design process from the very beginning. The variety of ages and occupations, for example people in and outside of working life provided many different aspects to the process.

### **Performance measurements**

The most common medium for (outwards) measurement in the data was customer feedback. It was implemented in various forms, from traditional paper sheets to digital questionnaire forms and NPS.

The data does not highlight any of the applied performance measurements, other than feedback gathering. From the feedback collection methods, no individual medium was not underlined nor the success of those mediums highlighted. The positive results of those feedbacks, however, were introduced, although the actual information from those scores is relatively minimum. The positive result being a high ranking in the customer feedback score. The problematics in that kind of measurement is the information that is not recorded, for example the feedbacks of those who don't reply to the questionnaires or NPS.

Similar to all feedback collection in the data was that the activity was irregular. Another tendency was the collection of feedback after implementation of the service only, and not since. It can be assumed that the amount of knowledge collected in those

occasional and potentially remote surveys is either fragmented or not prevalent. Such non-systematic model might be an obstacle for further development opportunities in the mobile health service.

In the data, one of the biggest trends was the amount of oral feedback from customers and from or via employees of the service. The many benefits of mobile health care services were gathered from empirical and unwritten sources, such as word of mouth at work, from customers to employees. A particular feedback was mentioned, about how the motivation of the employees affected to the customer-satisfaction of a certain customer of the mobile health care service.

## 6.2 Analysis of designing user-centric mobile health care services

In this section, the different design processes in the mobile health care services are discussed and analyzed. Additionally, solutions to the existing shortcomings are identified and practical implementations are proposed to address the identified shortages appeared in the data. Finally, outcomes will be analyzed from the service design point-of-view. In the analysis, the representatives interviewed for the research will be referred to as informants. The term user will be representing all users of the service, including the customer, employees, management and other potential users of the service and those will be identified more precisely when the context requires so. The service provider in the analysis represents the facet or organization conducting the mobile health care service, regardless if they are a private or public operator. The informants of the services are either management or employee level representatives, some are managers of the service and the service provider company and some are involved in the operational duties only – some are both.

The analysis is categorized under the themes according to service design's design processes and the user-centricity and co-design are discussed under those themes individually. Lastly, conclusions are drawn upon the thematic analysis.

## **Recognizing the need**

Several methods for the need recognition appeared in the data. The most comprehensive medium of gathering information was individually assigned survey projects that were particularly launched for gathering the required information to define whether there is a need for the mobile health care service. It can be seen as the extreme of the mediums of gathering the knowledge of the need for the service. Another initiative for the need recognition in the data was investigating external publications and research on mobile health care services and background information related to them. The relationship between the two can be seen as research-based information about the need for the planned service which form a realistic and reliable review on the need for the observed services.

Empirical findings for recognizing the need for a mobile health care service were made by employees and managers of the organization through their occupation or existing health care operations. According to the data, some triggers to the need definition were lack of resources of the service provider itself, need for development in the operations, seeking of competitive advantages, or observations of the citizen needs such as poor access to service or time management related issues. Besides personnel observations, an initiative also came from the citizens themselves. An extreme to the need definition in comparison to the data collection discussed previously was the idea for the service from an executive of a company, based on their own intuition. According to the data, no further studies were conducted to confirm those intuitions.

The information regarding the necessity of the mobile health care service were collected from the citizens, professionals and (educational) institutions. An observation was also occasionally on other, existing mobile health care services, which provided information to the service providers. Representatives and customers of those mobile health care services were collected data from, in order to gain knowledge about the implementation and experiences of them.

The empirical observations had been collecting insight from real-life situations and users, such as customers, employees, executives, managers and citizens and their experiences in the field. The importance of empirical findings, according to the data,

is relevant and provides solid base for information related to defining the need for services. They can also be more casual, but also impulsive. It also conducts the user-centricity highlighted in the framework, which emphasizes the importance of user-participation in the need definition stage of the design process.

The research-based knowledge on service need and background knowledge is perhaps a more resource consuming approach but can act as a good method for a newly to-be launched service, whereas the empirical definitions might occur within process of existing services. The participation of the user in the more formal and profound data collection for the need is seen in form of surveys and research. The timeliness and currency of the results in such research and surveys could be seen as a risk, as the system of such data collections are somewhat less prompt than for example, oral feedback. That said, results of research are often conducted in a more reliable manner and cover larger respond groups than individual feedback.

### **Design process**

Most methods described in designing the mobile health service in the data were common means of service design. Although there was no need to assume these methods are not applicable to designing mobile health care services, it can be stated that they have been successful in the context. Those methods were workshops, both visual and more traditional, surveys and questionnaires for users, brainstorming, presentations, to mention a few. Both visual and qualitative methods are applicable and described as successful. An alternative to familiar service design methods was the arrangements of thematic events for the local citizens. Such event was received well by the citizens and the attention towards the launching of mobile health care services can be interpreted as a beneficial medium for positive attitudes of the citizens and potential service users.

The focus group collection of the workshops in the data was emphasized by the informant and described as extremely important. The wide selection of various candidates from different age and occupational groups for co-designing the services in forms of workshops was key in the results which determined the outcome of desirable services for various end-users.

The traditional methods, such as phone- internet and face-to-face meetings were mentioned in the data but no emphasis was drawn to those. It could be assumed, that such methods are inevitable and provide no extra value to designing services, and therefore will not be highlighted any further in the conclusions.

In the service design process, the user was key in many cases of the data. The forms of customer collaboration varied from events such as forums and thematic occasions to individual surveys and interviews to collect data to apply to the design processes. The design processes included many target groups, for instance, i.e. the elderly, students, the disabled and children. The data shows a few differences in focus group selection – random, mixed groups amongst each other and specifically selected customer segments. Those informants whom had implemented the mixed focus groups for design, emphasized the success of those methods. An informant whom stated that the participation of the customer in the design process from the very beginning was extremely important, also clarified that another important aspect was the variety of socio-economical groups in the design process for versatile aspects.

The collaboration with students was mentioned in some cases, and it was seized to outsource some opportunities, such as collecting the data from the users for the design purposes. A mutual benefit was likely to be conducted with the collaboration with educational institutes, and perhaps resources released to other operations.

Professionals appeared to be involved in all stages in service designing process, except in prototyping, of which the data is minimum. In the design stage of the mobile health care services especially, professionals were employed to gain additional information about the components of the service or service facilities, such as technical features of the vehicle. Professional drivers were also included in service processes. External expertise was used in form of insight in solutions, for instance, some ambulance personnel to share their knowledge on technical aspects on driving in the countryside. In internal use of professionals, the tasks that needed to be designed were divided into teams according to the areas of expertise. Another philosophy appeared in the data was the components which were always designed together although led by the experts of that area.

It was emphasized in the data that one of the managerial operators of the design project was always included in all teams of the design. The data highlights the importance of such co-design including multiple experts from different areas of expertise. In addition, the consistency of persons in the design groups maintaining the same throughout the whole process, was mentioned. The modeling of existing mobile health care services in other countries were observed in order to develop a similar one in Finland.

Employee participation was present in the data as well. Especially, in the design process, future employees of the service were included in the decision making and influencing their future working environment. The managerial level in the decision processes in the design of the services was also in a role in the data. They also visited municipalities that had mobile health services and interviewed their employees and conducted interviews to their potential customers.

### **Prototyping**

As prototyping was absent in the data, it could be interpreted that it is not essential, however the long-term effects of such lacking are difficult to analyze. The fact that the size of the data is relatively small, also effects on the reliability of such assumption.

The service provider that did test their service with two customer segments gathered a number of information about the experience of the service, yet the use of that knowledge is not seen in the data. It can only be assumed that the data of the information from potential prototyping is valuable for further development, identifying problems before implementation, possible adjustments and the opportunity to create comparable statistics for the future. The service operator also gathered information from employees, comparing the mobile health care services to the corresponding onsite services. The data from those comparisons can be seen as development initiatives for the offsite facilities in terms of both operational quality and employee satisfaction.

The service provider that tested the service before implementing it, used two segments to do so, and addition to that, the students collaborating to the design processes, were

also experience informants. They also acted as feedback informants in the role of future customers.

### **Performance measurement**

The most common medium for (outwards) measurement in the data was customer feedback. It was implemented in various forms, from traditional paper sheets to digital questionnaire forms and NPS.

The data does not reveal any of the applied performance measurements, other than feedback gathering from customers. From the feedback collection methods, no individual medium was not underlined nor the success of those mediums highlighted. The positive results of those feedbacks, however, were introduced, although the actual information from those scores is relatively minimum. The positive result mentioned was a high ranking in the customer feedback score. The problematics in such of measurement is the information that is not recorded, for example the feedbacks of those who don't reply to the questionnaires or NPS.

In the beginning of the service implementation, one service operator was collecting the feedbacks systematically from every customer. Even though they don't actively collect feedbacks any longer, the data collected in the beginning of the life of the service is most probably reliable. It reduces the odd of gathering data from only certain respondent groups, such as only satisfied or dissatisfied customers.

Similar to all feedback collection in the data was that the activity was irregular. Another tendency was the collection of feedback after implementation of the service only, and not since. It can be assumed that the amount of knowledge collected in those occasional and potentially remote surveys is either fragmented or not prevalent. Such non-systematic model might be an obstacle for further development opportunities in the service.

In the data the amount of oral feedback from customers came and from or via employees of the service. The many benefits of mobile health care services were gathered from empirical and unwritten sources, such as word of mouth at work, from



customers to employees. If these benefits and areas of success could be recorded in some form of documentary, they could be act as a valuable resource of information and knowledge about the operating services and their impact.

### **Concluding analysis**

In terms of co-design, many of the phases of the design process were conducted in collaboration or co-operation with different stakeholders, including customers, employees, professionals and sometimes educational institutions. It demonstrates the fact that in the context of mobile health care services the user-centric co-design is applicable in all stages of common service design process. It also contributes to the opportunities of alternative stakeholders able to include in the different design phases.

The data shows many aspects highlighted in the framework of service design. Co-design have been fertile to the service providers according to the data of the study. In contrast, lack of experience prototyping was absent, and stated as unnecessary. In the framework studied previously, it is emphasized that prototyping should be practiced before implementing the service as it provides many benefits including development of the service. (Sauvola et al., 2016; Buchenau & Fulton, 2000; Pinheiro, 2014; Sauvola et. al., 2016.)

Another shortcoming of the interviewed focus group was the lack of systematic or regular feedback collection after implementing the service. In fact, none of the respondents could describe having a systematic operation in terms of feedback from either customers or personnel of the service. Together with lack of prototyping, the amount of information of the performance is bare minimum and leaves little or no room for easy alterations and further development. To ensure a long life-cycle and high quality in services, service providers are encouraged to invest in strategies of knowledge on needs and performance (Politt et al., 2007). Without the ability to analyze the long-term effects further, it can be claimed that either prototyping or performance measurements of the service would provide valuable information about the result of the service design and its' user-satisfaction.

The simulation of other existing mobile health care services in the data was common and worth recognizing. According to the informants, it gave the projects valuable information on how to implement services either in a similar or completely different manner. Pollitt (2007) also declares that such modeling can work as a good method to recognize good practices for services. It can be assumed that in the context of mobile health care services, such method is considerable.

The need for the executed service in the data was widely defined by the service providers prior the designing of the mobile health care services. According to Sirviö et al. (2017), a starting point in the design process should always be the need of the customer and defining that need. It ensures the continuum and utilization rate of the service. Several methods for the need recognition appeared and the most comprehensive medium of gathering information was the assigned survey projects that for gathering the required information. Another extreme in comparison was the idea for the service from an executive of a company, based on their own intuition. According to Pollitt (2007) the assumption is, that changes are coming from the top of the organization and therefore will be implemented in the strategy of that organization. The outside suggestions are ranked to be in the bottom in terms of reacceptance. Without further knowledge, it can only be speculated whether similar initiatives had been suggested by other members of the organization. By time, the lack of knowledge of the operations of managerial level may be insufficient for developing the services and the studies suggest that by designing services together with customers, they ease the tasks of the managerial level in the future (Polaine, 2012).

In the data, one of the biggest trends was the amount of oral feedback from customers and from or via employees of the service. The many benefits of mobile health care services were gathered from empirical and unwritten sources, such as word of mouth and discussions within treatment. If the benefits and areas of success could be recorded in a documentary form, they could be act as a valuable resource of information and knowledge about the operating services and their impact. With regular feedback collections from all users, including the employees, perhaps the oral customer feedbacks could be collected in order to record the reviews for measurement. Perhaps, in the forms of those regular feedbacks, initiatives for such innovations as mobile

health care services or other important ideas would be delivered in comparison to independent initiatives.

The feedback on the motivation of the employee by a satisfied customer emphasizes the importance of including the employee of the service in the co-design process of the service. As one of the main challenges in service design in health care is the patient-doctor relationship, which is preventing the bigger changes in industry (Shove, 2003; Freire & Sangiorgi, 2010), it can only be assumed that including the employee of the service is crucial in the design process to encounter their perspective in the changes of their working environment.

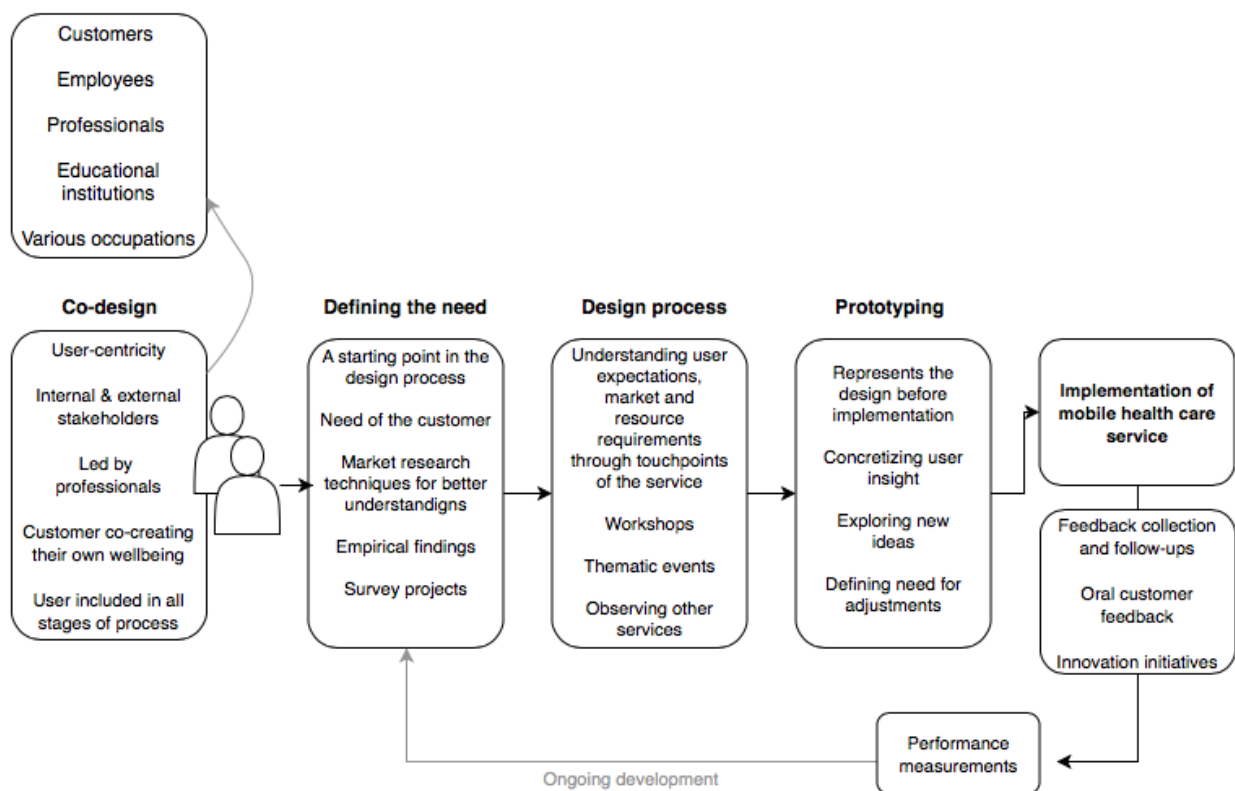


Figure 2 User-centric service design in mobile health care services 2.0

## 7 CONCLUSIONS

### 7.1 Theoretical implications

The main goal of this research was to answer the research question: *How to design user-centric mobile health care services through service design framework?* This was supplemented with the following sub-questions: *What are the core stages of service design process?* and *How to include the user in the design process of mobile health care services?*

The purpose of the study was to explore a mobile health care service provider's opportunities in designing user-centric services. Thus, the research serves a practical need in addition to theoretical contributions. To contribute to literature, discussing and combining the theoretical points of view on service design, user-centricity and design thinking in health care and mobile health care services, this study submits to knowledge on designing user-centric mobile health care services and how it can be implemented in practice by each phase.

In the theory review, the questions are answered based on literature concerning service design and user-centric design thinking in health care. By discussing and combining the theoretical points of view on service design, user-centricity and design thinking in health care and the context of mobile health care services, this study makes a contribution to knowledge on designing user-centric mobile health care services and how it can be implemented in practice by each stage of the design process.

Although service design architecture is relatively common in the context of health care, research in service design in mobile health care has been significantly smaller so far. According to existing research, service design and related co-design methods have been successfully adapted to the health care industry and the co-design methods key to the service design approach have achieved desirable results according research. The growing requirement for mobile health care has been addressed, yet research process of its design have yet not been conducted. This research aimed to fill that gap in order to define a solution to framework for designing those services with user-centric service design methods.

This study confirms the adaptability of service design in mobile health care services. It also reveals many practical aspects regarding the design process and the possibilities in co-design activities. More precisely, this study suggests that the user of the service can and should be included in all stages of service design process of mobile health care services in several ways – from defining the need to the implementation and ongoing development. The user-centricity in the context of this study means the users of the service that are involved in the service operations along its way – including employees and other encounters to the service.

Moreover, this study contributed to the model of service design by assessing its suitability to designing mobile health care services with user-centric approach and gathered concrete practices of such methods and addressing potential shortcomings in the design process.

The outcome of this case study was a multi-phased framework for designing mobile health care services with a user-centric approach. It also proposed new tools and methods for gathering data, transforming service design methods into practicalities in the context of mobile health care services, and finally providing tools for the important development of the performance within the context. Some important observations were also made in terms of crucial elements in the design process of mobile health care services. The case study initiated a research interest towards service design and its possibilities in the mobile health care service context in the health care sector.

## 7.2 Managerial implications

The critical observance of the operations of some mobile health care service providers can provide useful examples of how to implement service design in such services successfully and by acknowledging some limitations that the currently existing services might either have or lack performing, a future service provider may be able to form a more coherent service without neglecting the same shortages.

As a concrete implication, it could be underlined how much of importance the collection of feedback serves to the organization. When the emphasis is on designing user-centric mobile health care services that are also fertile for the service provider,

gathering feedback is a medium of measuring the performance and satisfaction of the service for all facets. It should perhaps be as important as the measurement of measurement of profitability, which is often a self-evident for organizations.

According to this study, it can be suggested that a service provider may either invest in the appropriate prototyping of the service to gather the appropriate data for developing the service before implementation, or in systematic feedback gathering after implementation to make needed development and adjustments accordingly. Ideally, one would perform both to maximize the opportunities of those methods. By gathering the feedback from both customers and employees, the data between those encounters could be documented as well as the amount of employee initiatives.

### 7.3 Evaluation of the research and its limitations

Throughout the research, the quality was considered, as suggested by Hirsjärvi and Hurme (2000). The reliability and validity of the research design and process are evaluated from the viewpoint of this study.

Validity can be divided into statistical validity, construct validity, internal validity, and external validity. In this case, as a qualitative study, the statistical and internal validity are not relevant. (Hirsjärvi & Hurme, 2000.) Structural validity on the other hand can be seen as quite important in a research using qualitative methods. Through construct validity, it is evaluated how the research corresponds with reality, and how it succeeded to measure what it aimed to measure. (Hirsjärvi & Hurme 2000; Gummesson 2000). Hirsjärvi and Hurme (2000) emphasize that problem of interpretation is the key and that construct validity can be built through triangulation. In this research, construct validity was particularly applied through theoretical triangulation. This was done by creating a framework that could be used to reflect against the case. Interviews were conducted for both at the employee and at the management level although other methods, such as observations, focus group discussions and interviewing customers would have enhanced the validity of the research even further.

External validity refers to how well the results can be generalized to different situations and cases (Hirsjärvi & Hurme 2000). In order to assure the external validity in this

research, the case explained throughout its working processes to enable possibilities to adapt it to other similar research. Although, Koskinen et al. (2005) state that generalization in qualitative research can be seen to happen from case to theory. Nevertheless, the results of this study are targeted to the context of mobile health care services, thus adjustments needs to be made to copy the study.

Reliability of a research describes how well it can be replicated, according to Gummesson (2000). In practise, it means that if two persons study the same phenomenon with similar objectives, the result should be approximately the same. In this study, the reliability was pursued with narrating the empirical research process in detail, leaving no gaps in the report. The results are analyzed with the presented frameworks earlier in the research. The lack of citations in the data may cause little room for conclusions by the readers, yet the descriptive narrative in terms of manuscript in the empirical data section is aimed to compensate for that shortage by being precise. The recordings of the interview are available upon request may someone wish to examine those further.

The study aimed to avoid risks in single-case research, therefore multiple informants were interviewed for the research. In addition, equal amount of both private and public service operators was collected data from to avoid the effects of the service operator background to the generalizability of the results. To be able to draw more dramatic conclusions than this study could, the size of data should be significantly larger.

#### 7.4 Directions for future research

This study proposes an adjusted framework for designing mobile health care services with user-centric orientation. There is no reason to doubt whether the suggestions presented in the context could be examined even further. Given that this research is exploratory, the results of this study have not been applied to practice. In order to test the theories presented in the conclusions of this study, a practical implementation with reporting the results could be in place. To form data on long-term effects, regular, over-time observations would have to be conducted. In addition to aforementioned, the existing challenges in service design and health care, for example in regards to

employee motivation in service entities, could be examined with the required depth in order to solve those issues.

As the concept of mobile health care is relevant and timely, also declared earlier in this study, the future possibilities in research in the context will be many. Another important aspect of research at the time is the issue of sustainability, an extremely relevant field of study which can be applied to many research contexts –service design nor mobile health care service being no exception. The social responsibility and effects, environmental issues and the effects on the economy of mobile health care services together would form a valuable justification for the importance and impacts of service from a scientific perspective.



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## APPENDIX

## Appendix 1. Mobile health care services in Finland

Mobile health care service(s)	Service provider	Name of the service	Operating municipalities	Region
<b>Public service providers</b>				
Dental hygienist, nursing services	South Karelia Social and Health Care District	Mallu	All municipalities in South Karelia	South Karelia
Laboratory services	South Karelia Social and Health Care District	Malla	Lappeenranta, Imatra	South Karelia
Dental services	City of Jyväskylä	Suupirssi (leased)	Jyväskylä	Central Finland
Diverse health care services, laboratory services, pharmaceutical supplies	City of Rovaniemi	Onni	Rovaniemi	Lapland
All dental services	City of Helsinki	Liisu	Helsinki	Uusimaa
Variety of health care services	Lahti University of Applied Sciences	Linkku	Vääksy, Vuolenkoski, Padasjoki, Orimattila, Lahti, Kausala, Kalkkinen, Hämeenkoski, Hollola, Hartola	Päijänne Tavastia
Eye examination for diabetics	OYS Oulu University Hospital	Silmo	Oulu	Northern Ostrobothnia
MRI Scans	OYS Oulu University Hospital	N/A	N/A	Northern Ostrobothnia



## Appendix 2. Interview structure

Nimi ja titteli, sekä edustamasi organisaatio?

- Mikä on tittelisi englanniksi, jos tiedät?

Onko liikkuva palvelunne uusi palvelu, vai muutos olemassa olevaan palveluun?

Miten palvelun tarve määriteltiin?

- Miten dataa kerättiin?

Ketä oli mukana palvelun suunnittelussa?

- Esim: asiakkaita, kohderyhmää, ammattilaisia, rahoittajia?
- Mitä lisäarvoa he toivat suunnitteluun? Entä lopputulokseen?

Käytännöt, joita käytettiin suunnittelussa?

- Esim: workshopit?
- Miten kerättiin dataa? Esim: haastattelut?

Kontaktipisteet/osa-alueet joita suunniteltiin? (touchpoints)

- Ketä suunnittelussa oli mukana?
- Toimiko suunnittelijat yhdessä vai erikseen?

Testattiinko lopputulosta ennen sen käyttöönottoa?

- Kuinka onnistumista on arvioitu?
- Mitä osa-alueita arvioitiin? Kuinka?
- Kenen kanssa?

Arvioidaanko palvelua yhä säännöllisesti?

- Kuinka arviointi tehdään?
- Mitä osa-alueita arvioidaan? Kuinka?
- Ketkä arvioivat?

Onko sinulla palvelun suunnittelun tiimoilta jotain, mitä pidät erityisen tärkeänä tai tuottavana, tai haluat muuten nostaa esille? Tai jotain epäkohtia/epäonnistumisia?

Lisäkysymykset:

Mitä muita liikkuvia terveyspalveluita tiedät?

Oletteko ottaneet mallia jostain?

Onko teillä palvelunne suunnittelun osalta mahdollisesti jotain relevanttia lisämateriaalia tai kommentteja?