Jasmiina Korpimäki

THE IMPACT OF CO-CREATION ON A DIGITAL HEALTH START UP’S BUSINESS MODEL: A CASE STUDY IN THE HEALTHCARE CONTEXT

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The purpose of this qualitative case study is to understand the impact of co-creation on a digital health startup’s business model in the context of healthcare.

The research objective of the study is to examine the form of co-creation and business models within the two chosen digital health startups and specifically how co-creation progresses in them. The main research question is to examine how co-creation impacts a digital health startup’s business model. Theoretically, the impact of co-creation on a startup’s business model is evaluated through the features of co-creation and the nine elements of Business Model Canvas (BMC). The background of the review consists of the constant change of markets and customers’ needs as well as the context of healthcare.

The aim of the study is to provide information about the central criteria of co-creation with which we can evaluate the impact of it on the digital health startup’s business model. The data will be collected through a semi-structured theme interview from the personnel of two chosen startup businesses (n=4) and data will be analysed through content analysis.

According to the findings of the research, co-creation is vital for startups in the context of digital healthcare. The biggest impact of co-creation is that it aids the startup to get into the hospital environment and helps it to understand the environment in which the services are used in. Getting into the hospital environment enables the companies to produce products that fit the customers’ needs, helps them to reach the target market and aids in selling the product, boosts their credibility and engages the customers.

The findings point out that co-creation has positive impact on the elements of BMC. The only element of BMC with a negative impact is revenue streams. In addition, the central criteria that can evaluate the impact of co-creation on a digital health startup’s business model was identified. The criteria showcased special features of a digital health startup.

This study increases information regarding co-creation in the context of healthcare for different stakeholders involved. The findings can be used to increase the functionality of co-creation and when evaluating the impact of co-creation on a digital health startup’s business model.
## CONTENTS

### FIGURES

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

### 1 INTRODUCTION

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Background of the research</td>
<td>7</td>
</tr>
<tr>
<td>1.1.1 The utilisation of digitalisation</td>
<td>8</td>
</tr>
<tr>
<td>1.1.2 Future Hospital OYS 2030</td>
<td>10</td>
</tr>
<tr>
<td>1.1.3 Wille project</td>
<td>11</td>
</tr>
<tr>
<td>1.2 Importance of the research topic</td>
<td>12</td>
</tr>
<tr>
<td>1.3 Purpose of the research and research questions</td>
<td>13</td>
</tr>
<tr>
<td>1.4 Research method</td>
<td>14</td>
</tr>
<tr>
<td>1.5 Definitions of the key concepts</td>
<td>14</td>
</tr>
<tr>
<td>1.6 The structure of the research</td>
<td>15</td>
</tr>
</tbody>
</table>

### 2 CO-CREATION

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Definition of co-creation</td>
<td>17</td>
</tr>
<tr>
<td>2.1.1 Value co-creation in the centre</td>
<td>19</td>
</tr>
<tr>
<td>2.1.2 Consumer co-creation</td>
<td>20</td>
</tr>
<tr>
<td>2.2 Blurring boundaries</td>
<td>21</td>
</tr>
<tr>
<td>2.3 Elements of co-creation</td>
<td>22</td>
</tr>
<tr>
<td>2.4 Benefits and challenges of co-creation</td>
<td>24</td>
</tr>
</tbody>
</table>

### 3 BUSINESS MODEL

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Definition of business model</td>
<td>25</td>
</tr>
<tr>
<td>3.2 Business models and co-creation</td>
<td>26</td>
</tr>
<tr>
<td>3.3 Business Model Canvas</td>
<td>27</td>
</tr>
<tr>
<td>3.4 Business models in the digital health sector</td>
<td>29</td>
</tr>
</tbody>
</table>

### 4 SUMMARY OF THEORETICAL FRAMEWORK

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
</tr>
</tbody>
</table>

### 5 METHODOLOGY

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Method of empirical inquiry</td>
<td>34</td>
</tr>
<tr>
<td>5.2 Data collection and method of analysis</td>
<td>35</td>
</tr>
<tr>
<td>5.3 Content analysis</td>
<td>37</td>
</tr>
<tr>
<td>5.4 Overview of the case companies</td>
<td>38</td>
</tr>
</tbody>
</table>

### 6 FINDINGS

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1 Impact on the value proposition</td>
<td>40</td>
</tr>
</tbody>
</table>
6.1.1 Producing a product according to customers' needs ........................................ 40

6.2 Impact on the customer relationships ................................................................. 43
   6.2.1 Physical and remote communication .......................................................... 43
   6.2.2 Activation of customers and end-users ....................................................... 46
   6.2.3 Equal participation ....................................................................................... 47

6.3 Impact on the channels ....................................................................................... 48
   6.3.1 Assistance in sales ....................................................................................... 48
   6.3.2 Improvement of reputation and status ......................................................... 50
   6.3.3 Increasing credibility .................................................................................... 50

6.4 Impact on the revenue streams ........................................................................... 52
   6.4.1 Obtaining turnover and funding ................................................................. 52
   6.4.2 Success indicators ....................................................................................... 53

6.5 Impact on the key resources and cost structures ............................................... 54
   6.5.1 Increase in resources .................................................................................. 54
   6.5.2 Occurrence of costs ..................................................................................... 55

6.6 Impact on the key partnerships ......................................................................... 56
   6.6.1 Gaining partnerships .................................................................................. 56
   6.6.2 Access to the markets ................................................................................ 57

6.7 Impact on the key activities ............................................................................... 58
   6.7.1 Better access to the hospital environment .................................................. 58
   6.7.2 Co-creation at an early stage ...................................................................... 59
   6.7.3 Other experiences of co-creation ............................................................... 59
   6.7.4 Development proposals for co-creation ..................................................... 62

7 DISCUSSION AND CONCLUSION ..................................................................... 64
   7.1 Discussion ....................................................................................................... 65
   7.2 Reliability, validity and limitation of the research ......................................... 70
   7.3 Suggestions for future research ..................................................................... 74

REFERENCES .......................................................................................................... 76

APPENDICES ......................................................................................................... 83

Appendix 1. Theme interview questions ................................................................. 83

Appendix 2. Example of content analysis ............................................................. 87
FIGURES

Figure 1. Business Model Canvas (Osterwalder & Pigneur, 2010) ........................................ 29

Figure 2. Summary of theoretical framework .................................................................. 33

Figure 3. The findings derived from content analysis ...................................................... 40
1 INTRODUCTION

“To buy or not to buy”, a modern capitalistic equivalent of Shakespeare’s Hamlet, as expressed by co-creation guru Venkat Ramaswamy and Kerimcan Ozcan in 2014. The authors highlight an essential notion that this firm-centric paradigm of the conventional enterprise has served us well for many years, but is rapidly becoming outdated. The nature of the relationships between consumers and firms have changed radically (Prahalad & Krishnan, 2008). Digitalization, globalization and Internet have guaranteed that consumers are no longer passive recipients of supply but actively participating in the co-creation processes. This shift requires changes from the firms, and especially regards to their business models (Ramaswamy & Gouillat 2010, Ramaswamy & Ozcan, 2014, Seppälä et al. 2016). The businesses that are capable of changing their business models to match the ever-changing needs of markets and end-users will outperform their competitors (Casadesus-Masanell & Ricart 2010).

Around ten years ago, the field of eHealth and telemedicine would have been considered impossible and this is why regulations and authorities are often behind the movement (Ståhlberg 2016). Finland is well its way towards a digitalised healthcare industry. In fact, Finland is among the top three strongest health technology economies in the world. (Finland Health 2017.) There are already many healthcare services often used and needed electronically for patients. Digital healthcare options are viable as they could save several millions each year because they provide the opportunity for patients to replace face-to-face visits which are one of the major costs within the nation. (Hyppönen et al. 2015.)

Service innovation will accelerate in a digital world. More and more innovation will be intangible, digitally enabled, and created or co-created around social phenomena. The extant studies on service innovation have failed to offer insights on emerging digital service innovations. Information technology (IT) can play a major role in enhancing the opportunities for service innovation. (Lusch and Nambisan 2015.)
The topic for the research derives from the Director of Research of Wireless Lab Environment for Business (Wille) – project.

This part presents the background of the research, importance and aim of the study as well as the research questions. Then it moves on to the research methods, key concepts and the structure of the research.

1.1 Background of the research

Despite the economic crisis, the number of startup companies has remained stable in the recent years. The guiding principle of startups is agility, innovation and independency. A key source of competitive advantage is an efficient business model. The company also needs support (including funding for growth) in various forms to survive. An important support for an entrepreneur is simple and stable legislation and regulatory environment. According to Lahtinen et al. (2016), 80% of the new startups will survive for three years and 70% will survive the next five years.

There are around 5000 health and wellbeing technology startups in the world and 300 of them are from Finland. This means that Finland has the most digital health startups in the world in relative to the size of the population. In addition, Finland is the second best country in the world with the most providing digital health startups, behind the United States of America. Finns are skillful in developing innovative clinical solutions and are more oriented towards international markets compared to the rest of Europe. The most important factor for success in the digital health technology field is cooperation between partners as well as device manufactures or mobile operators. (Jones 2014.)

The inability to satisfy patient needs drives the healthcare transformation agenda and the demand to improve patient care processes. The enduring issue is that the solutions that arise from the health and wellbeing startups are in many cases too technology oriented and they often fail to take into consideration other stakeholders such as the healthcare professionals or even the patients (Pikkarainen 2016a.) This happens because the involvement of these other parties into the actual solution can be very time-consuming and difficult in general. The convergence of these factors has
inspired the healthcare leaders to rethink the traditional models of digital healthcare service delivery. Weimar (2009) points out that the engineers can sometimes be difficult to convince to create solutions from other stakeholders’ point of view and, in addition, it is hard for the medical staff to keep up with the ever-changing technology. However, the difficulties do not outweigh the benefits so these changes towards a more digitalised hospital are, in fact, pursuable. There is clearly a need for developing combined solutions and an increasing need for collaboration between the different parties as well as completely new business models. (Pikkarainen, 2016a.)

1.1.1 The utilisation of digitalisation

Digibarometri (2016) showcases a comparison between 22 countries to measure their prerequisites for digitalisation. Finland is at the top. The study measures the social exploitation of digitalisation. Digitalisation is a great but rather untapped opportunity in Finland. New types of digital business models and companies that promote them are needed. In the future, instead of technology, the ability to build new opportunities for business will increase. By utilising digitalisation, it is possible to gain competitive advantage and increase the growth rate of companies. According to Digibarometri (2014), most of the growth potential in the Finnish economy is related to digital or its exploitation. Digitalisation has a lot to offer especially in developing services and service businesses.

By evaluating each component, Finland is one of the top in qualifications, fifth in usage and in the top three in influence. Regarding sectors, Finland is number one in the corporate sector, third in the public sector and fourth in the comparison with the public. The position of Finland in the latter is affected the most by the effect of digitalisation on the public. One of the dimensions measuring this is healthcare mobile applications, for example, systems that allow remote medical consultation and other procedures. The other Nordic countries are utilising the healthcare mobile applications better than Finland. Finland's strengths are prerequisites. For example, technology regulations support various innovation activities and this is considered to be the most advanced in Finland among the countries of comparison. In addition, Information and Communication related Technology (ICT) legislation is also the best out of these countries. The element requiring the most improvements is the usage of
digital services and products. In the corporate sector, Finland is ranked first by the index that measures the impact of digitalisation. (Digibarometri 2016.)

Digibarometri (2016) notes that compared to the other countries, Finland is lagging behind in improving the productivity of healthcare through digitalisation. For example, in the United Kingdom, the public sector utilises ICT to improve the productivity more effectively than Finland. Digitalization has brought untapped opportunities to different industries. One way to faster growth and market success is to exploit the potential of digitalisation. Especially in non-ICT sectors, such as healthcare (Digibarometri 2014). There are no traditional borders in the web. Growth is possible by expanding into new markets. This example has been demonstrated in Finland by several startups across industries. Most Finnish companies, however, seem to be concentrating on the domestic market. The recipe for success regarding the Finnish companies is also being aware of the rapidly changing needs of consumers and to meet these needs irrespective of their geographic location. (Digibarometri 2016.)

According to Kattenbachin et al. (2010) technology provides more flexible ways to work. Tasks at work can be handled regardless of time and place. This has been shown to increase productivity and wellbeing at work. Vuolle (2010) elaborates that employees are now able to react quickly to unexpected situations when they are on the move and they can take advantage of the free time they have by reading emails from their mobile phones. Technology enables us to communicate effectively and to work together regardless of one’s physical location. Time will be saved when it is not necessary to travel long distances to meetings. (Lönnqvist et al. 2013.)

Continuous change is everyday life in the industry of healthcare. The technological development in the healthcare industry is fast. The well-perceived ways spread quickly to the other patient groups. Personnel involvement in the development is essential in regards to operations that aim for continuous development. The basis is that employees should acquire some skill or know-how that the supervisors do not have. Behind a consultative information system there is always the people and their know-how who have designed it. Information systems can acquire time from the personnel if they do not obtain the skills to use them. It is challenging to get the
personnel involved in trainings if they are not provided a substitute for the duration of the training and are forced to miss out on it because of labour shortages. Orientation of programs can be self-sufficient and slow. (Kulvik et al. 2013.)

1.1.2 Future Hospital OYS 2030

Oulu University Hospital (OYS) is a pioneer, research and development-oriented provider of high quality healthcare. Patient care is based on the latest research, best practices in treatment, and the newest technology. The hospital employs 6,800 professionals. OYS has a substantial role in the development of OuluHealth. This unique environment makes it possible to innovate new service concepts and use cases in a simulated hospital environment together with the key players from healthcare, industry and research ecosystems. By 2030, the hospital will invest EUR 500 million in the development of its functions and innovation of its premises. Future Hospital is an extensive operational renewal program, which will secure the position of OYS as a national and international top provider of specialized healthcare. (OuluHealth 2016.)

Professor Minna Pikkarainen (2016), the Research Leader of Wireless Lab Environment for Business project (Wille) elaborates that a digital hospital is a future hospital in which numerous technologies from digital communication tools to vital medical devices are combined to collectively improve productivity, operations, safety and the whole of patient care. The patients could be treated faster and more cost-effectively, if the hospital would run better as a whole. Therefore, the goal is to provide a hospital with multi-functionality and versatility, proper utilization of technology, comfortable facilities and the efficient use of renewable energy solutions without forgetting the improved quality, productivity and effectiveness of patient care. Creating above-mentioned smart hospital is an integral part of the future hospital. By utilising information systems and the newest technology, it is possible to improve the operations and let healthcare experts focus on their core expertise. Moreover, this will improve the quality of healthcare. The deadline for the renewal of the entire hospital is scheduled to be around the year 2030. This renewal program is divided into projects that will be created sequentially in order not to disrupt the
operations of the hospital. The first stage of the Future Hospital 2030 program is the launch of the children and women’s hospital’s renewal. (OuluHealth 2016.)

1.1.3 Wille project

The Research Director of Wille project, Pikkarainen (2016) elaborates that the project combines research and the development of innovation activity. The project investigates different business models. The cooperation with companies targets to introduce and experiment new business models. The resulting operating model enables the digital service platform and services integrate as part of the treatment processes. (Haapaniemi 2016.)

The intention of Wille project is to create a service co-creation platform that enables the co-design of wireless digital services for hospital environment by researchers, the industry and the healthcare professionals without forgetting the end-users. This project will support the development of innovative service concepts for future hospitals. The service co-design with patients and professionals in an almost one to one simulated digital children’s hospital itself is a unique offering and demands close collaboration between different parties in business ecosystem. (OuluHealth 2016.)

Pikkarainen (2016b) elaborates the vitality of the WILLE project and states that to ensure a completely co-designed process, end-users, such as, doctors and patients, and the healthcare industry, including startups is included in the process. This engagement of the different parties offers a platform and resources that are seldom available and provides an opportunity for startups to validate their value chains and utilize cases in an environment that is usually out of reach. The platform will benefit the future hospitals and create new opportunities for the companies involved. One of the projects aims to develop digital support systems for children going into surgery and are in constant need of monitoring and collaboration support with the hospital after the surgery. Another project focuses on building better communication support for situations in which the patient is taken to the hospital by ambulance. The 5G-test network will be used to support this new type of communication between the ambulance drivers, nurses and care workers in an emergency unit. The Wille project
involves many digital health startups from which two of them also take part in this study.

Pikkarainen (2016b) states that Wille project is coordinated by the Centre for Health and Technology and the Centre for Wireless Communications, Oulu Business School, Medical Imaging, Physics and Technology research consortium, Technical Research Centre of Finland and the Central Hospital of Finland. Moreover, BusinessOulu takes care of the entries of firms as well as their support. The project utilizes the OuluHealth, especially Oulu University Hospital’s TestLab surroundings. The Finnish Funding Agency for Innovation has granted EUR 900 000 for the project as part of the Innovative Cities programme.

1.2 Importance of the research topic

The expression of co-creation was popularised by Prahalad and Ramaswamy in 2004. Since the early days, practitioners and researchers have started to realise that co-creation is a vital procedure in succeeding in business and has benefits for consumers as well as for firms. The new technologies enable co-creation activities anywhere, anytime. Grönroos (2011) has conducted an interesting and opposing view against the notion that customers and firms would always be the co-creators of value and it also contradicts the marketing concepts created as early as in the 1900’s. The concept of co-creation has been studied quite extensively by many authors who have also looked into value creation. The concept of value creation was studied as early as 1970s in the service marketing research (Grönroos 2012). The term value co-creation was originated by Prahalad and Ramaswamy (2000) and further researched in famous books, including the future of competition: Co-creating unique value with customers by the same authors in 2004. Furthermore, Ramaswamy and Ozcan (2014) introduced the concept of paradigm in their book called The Co-Creation Paradigm in which individuals are seen in the centre of value creation as opposed to firms. Co-creation can also open new opportunities in inventing new business models.

The concept of business model has been widely researched and one of the most used expressions by practitioners as well as researchers is the business model canvas by Osterwalder and Pigneur in 2010. It is a visual representation of how a company
creates, delivers and adds value and it aims to guide the process of developing a new business.

Co-creation and business models together have formed the idea of crowdsourcing which is becoming increasingly popular (Kohler 2015). The author adds that a business model is a complex system full of interdependencies and side effects which is why the changes in the model should be proceeded with caution. The business model reinvention process should be a continual process. Whereas co-creation and business model research combined does exist, the impact of co-creation on startups’ business models has not been academically researched which makes this study relevant in purpose. Furthermore, the research topic derives from the Wille project, which showcases the direct need for this research.

Ojasalo and Ojasalo (2016) researched customer- as well as service-logic based business which recognises the value for different stakeholders and how they co-create value together and separately in their own everyday life. The researchers and developers of the Finnish Service Alliance (FSA) were guided by a need to find a tool that could help a business in implementing service-logic and customer-centric paradigm as well as agilely reforming their business model especially when the needs and challenges of the different customer segments change. Business Model Canvas (BMC) works as the base for the Finnish Service Alliance which is based on the notion of a traditional value chain. The structure is the same as in the Business Model Canvas except that each nine blocks also take into consideration the customer’s point of view. This is how the customer is in the centre of planning. (Ojasalo and Ojasalo 2016.)

1.3 Purpose of the research and research questions

The purpose is to understand the impact of co-creation on a digital health startup’s business model in the context of healthcare.

The aim is to provide information about the central criteria of co-creation with which we can evaluate the impact of co-creation on the digital health startup’s business model. The research objective of the case study is to examine the form of co-creation
and business models within the chosen digital health startups and how co-creation progresses in them.

To accomplish this objective, the research questions are

1. How does co-creation impact on a digital health startup’s business model?

   1.1. What is the criteria that can be used in evaluating the impact of co-creation on a business model?

   1.2. What are the main features of a digital health startup’s business model?

1.4 Research method

In order to reach the final answers for the research questions, this study utilises the help of two digital health startup businesses that have a varying experience from the industry as well as from co-creation together with hospitals, doctors and end-users. The research is conducted with the form of a qualitative case study as the aim is to interpret reality that is studied as comprehensively as possible. The study aspires to find or reveal facts. The data collection method is semi-structured theme interview to showcase the genuine voice and perspective of the candidates. The target group is not a random sample but the particular participants are chosen deliberately. (Hirsjärvi et. al 2002.) The methodology of the study is further discussed in chapter five.

1.5 Definitions of the key concepts

In this section, the following terms will be defined shortly: co-creation, business model and digital health startup. In addition, the terms of co-creation and business model will be discussed in greater detail in the theoretical framework chapter. The concept of digital health sector will be discussed in chapter 3.4. through a lens of a business model. The key concepts in this study are understood in the following way.
Co-creation is a strategic and close joint effort between, companies and consumers, involved in creating value that is unique to the customers and sustainable to the firm. In addition, co-creation is understood in a deeper level in which the value is co-created in personalised relationships and the experience of co-creation is the basis of unique value to each individual involved (Prahalad and Ramaswamy 2004). Co-creation can happen in varying environments and situations. The target of co-creation can be a diverse set of aspects, for example, strategy, value, product, service, space solutions, business idea or mode of operations. (Seppälä et al. 2016.)

A business model is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm. Therefore, we must consider which concepts and relationships allow a simplified description and representation of what value is provided to customers, how this is done and with which financial consequences. (Osterwalder et al. 2005.) In this research, the basis for a business model is the Business Model Canvas that consists of nine different elements that are value proposition, customer segments, channels, revenue streams, customer relationships, key resources, key activities (processes), key partners and cost structure. (Osterwalder & Pigneur 2010).

A startup refers to “an early-stage business organization that has existed no more than five years of age“ (Salminen 2014). Digitalisation refers to the “integration of digital technology into everyday activities by fully utilising the possibilities of digitalisation.” (Alasoini 2015). In this study, digitalisation is further understood in a wider sense by also covering different software, machinery and applications that can influence the current service and which can be further developed through digitalisation. Hyppönen et al. (2015) define the concept of e-health as the use of information and communication technology locally and at distance in healthcare. In this study, the term digital health is used accordingly.

1.6 The structure of the research

After the introduction, in chapter 2 the main theoretical concepts are elaborated. Co-creation covers the sub-topics of the definition and methods of co-creation, blurring boundaries as well as the benefits and challenges of co-creation. Also, the concepts
of value co-creation and consumer co-creation are being defined.

Chapter 3 gives an in-depth view about business models by focusing on business model innovation and the Business Model Canvas and finally, combining business models and co-creation and lastly, elaborating on business models in the healthcare sector. Chapter 4 is a summary of the theoretical framework.

After the theoretical discussion is methodology, that explains the method of empirical enquiry and data collection as well as the method of analysis in chapter 5. Then an overview of the case companies is given and initial data regarding the interview participants. The following chapter 6 explains the empirical findings of the study by utilising real quotes from the interviews. Empirical findings and theoretical review are compared together and discussed in chapter 7. In conclusion, the research questions will be answered and managerial implications and reliability of this research are discussed. You can find the questionnaire that is used in empirical research in appendix 1.
2 CO-CREATION

Major changes in business have increased the need for collaboration. The expression of co-creation itself was popularized by Prahalad and Ramaswamy (2004) as they explain that co-creation is a strategic and close joint effort between, companies and consumers, involved in creating value that is unique to the customers and sustainable to the firm. In addition, the concept has various benefits as it offers substantial potential for managers wishing to improve their innovation capabilities (Frow et al. 2015).

2.1 Definition of co-creation

Today, co-creation is understood in a deeper level in which the value is co-created in personalised relationships and the experience of co-creation is the basis of unique value to everyone involved (Prahalad & Ramaswamy 2004). According to Grönroos et al. (2015) value co-creation has evolved a lot in the past 10 years and generally refers to the means of interplay and cooperation between service providers and customers, resulting in experienced value for both participants. The methods of co-creation have also evolved and include tasks such as crowdsourcing, user idea contests, communities for user innovation, discussion forums and the creation of creative experience environments in which users have an active dialogue to co-construct personalised goods, services and business models (Harrington & Voehl 2016).

Huge changes in business have demanded a need for co-creation which according to Ramaswamy and Gouillat (2010) is a practice of developing services through collaboration with stakeholders and creating value jointly by the organisation and the customer rather than developing everything solely inside the firm. The end-users are no longer limited to waiting for what the company decides to offer them; rather they are more involved in the activity chain (Ramaswamy & Gouillat 2010, Ramaswamy & Ozcan 2014, Seppälä et al. 2016). This results in tightening the gap between production and consumption. Co-creation comprises democratisation as well as decentralisation of value creation meaning that the companies are starting to concentrate less inside the firm to interactions happening around them. The co-
creative atmosphere will lead to transforming of the conventional role of strategy, innovation, marketing and information technology. Despite of all the major changes, co-creation reduces the risks in business and increases market opportunities. There is also a possibility to increase brand awareness and build trust within the society one operates in. (Ramaswamy & Gouillat 2010).

According to Ind et al. (2012) co-creation proposes that interaction of individuals within a framework to evolve, re-define or invent something that is new. It is noteworthy that anyone who wants to test out co-creation must enter into a partnership with its customers as well as other stakeholders involved because the best solutions are developed with others. The authors point out that new innovations are often created by multiple people through social activity and not by individual people in sudden moments. It is valuable to add externals into the process of co-creation to enable better services. Regarding more technical solutions, it becomes harder to involve the end-users into the co-creation process where the task at hand can be very complex to understand, yet this is a vital procedure. As people are becoming more connected many organisations initiate co-creation procedures online through social media.

Overall, the co-creation literature recognises the importance of consumers’ creativity, knowledge, and technological capabilities and claims that firms should consider exploring situations where users take part in the processes of designing, developing, and producing goods because they are willing to do so in ways that are beneficial for both producers and consumers (Lang et al. 2015, Ramaswamy & Ozcan 2014). There are intangible breakthroughs in the current digital era that exist mainly because of IT, such as, Facebook, Google and YouTube whereas some innovations concerned new processes and user experiences such as Build-A-Bear and Starbucks or Netflix that completely removed the tangible object (Lusch & Nambisan 2015). Prahalad (2004) continues that consumers are indeed equally significant joint problem solvers. Grönroos (2011, 2008) criticizes these views by stating that it is the customers as users who are in charge of their value creation and the service provider could be invited to join this process as a co-creator which means that both parties would not be equal value creators. He continues that ‘the customer as the user and integrator of resources is a value creator’.
2.1.1 Value co-creation in the centre

According to Vargo et al. (2004, 2008) contrary to goods-dominant logic, service dominant logic focuses on the processes of serving rather than on a product (Lusch & Nambisan 2015). The current digital era has slowly moved the society away from the goods-dominant logic because from the perspective of the service-dominant logic, all product innovations are service innovations (Lusch & Nambisan 2015). Since service-dominant logic was introduced it has evoked a lot of interest among academics and practitioners to further develop and extend the notion of value co-creation. Prahalad and Ramaswamy (2000) originate the term value co-creation (Shamim & Ghazali 2015). The concept of value co-creation has been described by different definitions and this overlap became a source of confusion to many academics but also to practitioners. (Bharti et al. 2015.)

Grönroos (2012) notes that ‘value creation’ is very generally accepted in literature and defines value co-creation as mutual activities by parties involved in direct relations, aiming at contributing to the value that emerges for one or both parties. These experiences in direct interaction also add to overall experienced value. The author adds that value is always instrumentally created however, in many situations it can simply merge. As direct interactions are so vital in terms of value co-creation, the accessibility of resources and systems rise as a significant notion for the development of value. However, it is noteworthy that the strength of the process of value creation purely depends on the motivation, willingness and skills to perform in a way that contributes positively to the process. Companies and organisations can also create better environments for value co-creation by facilitating interactions among the actors, trying to adapt their internal processes or making their activities more transparent (Lusch & Nambisan 2015).

Furthermore, Ramaswamy and Ozcan (2014) state that we are facing a turn in value creation, away from a firm-centric, utilitarian view of one-sided value creation to a co-creation paradigm of value creation. This refers to stakeholders that together create value by focusing on the interactions where value creation happens. In addition, companies need to understand the process of value co-creation and proactively support it by establishing new organisational mechanisms and making
appropriate changes to their internal business processes (Lusch & Nambisan 2015). Also, it is vital to leverage the ecosystems of capabilities to generate new value creation capabilities and harness the resources of individuals and businesses as a joint resource base as well as innovate engagement platforms to connect joint value creation opportunities with joint resources. The reasoning for the joint objective lie in the wealth, welfare and wellbeing of the parties involved.

Prahalad and Krishnan (2008) express that the product- and firm-centric view of value will be replaced by a personalized experience and a co-creation view of value. This results in a world in which value is determined by one consumer co-created experience at a time. This aspect covers a variety of industries from travel and financial services to retail and entertainment industries. Furthermore, individuals, not firms, are now at the center of value creation, similarly than the earth revolves around the sun and not the other way around, as perceived at first (Ramaswamy & Ozcan 2014).

2.1.2 Consumer co-creation

Von Hippel and Katz (2002), Prahalad and Ramaswamy (2004), Hughes and Lang (2006) and Lessig (2008) have stated that consumer co-creation is a new occurrence that has substantial effects on businesses, consumers and culture if it is facilitated by technology change and driven by people’s need to participate in the creative process of making and remaking cultural goods (Lang et al. 2015). Lang et al. (2015) describe that several companies in the culture industries have already adapted to the new atmosphere and integrated components of consumer sharing and co-creation into their business model to leverage collective creativity and better serve demand.

According to Harrington and Voehl (2016), consumer co-creation means nurturing personalized interactions and experience results between a consumer and the producers’ company. This can be done throughout the whole product life cycle. Customers may share their needs and comments and even help spread the word or create communities in the commercialisation phase. Today, it is possible to enable continuous communication with the consumer. Traditionally, businesses have involved consumers by utilising them in their marketing research assignments, such
as, creating focus groups (Harrington & Voehl 2016, Ramaswamy & Ozcan 2014). However, these types of acts are very limited in interaction and not so beneficial for the parties.

For a company, it is vital to understand their customer thoroughly and to move forward by always understanding the customers’ needs as well as the business objectives. Businesses should also understand the questions customers might be pondering about. Therefore, new solutions are formed based on the above-mentioned together with the customer as well as the network of partners. The utilisation of digital channels is one way to increase the customer understanding. The understanding of the whole is expected even from the smaller actors in the field. As an example, the companies that are responsible for the maintenance of operating systems can create critical examinations, operational reliability analyses or lean analyses through their daily presence and understand more about their customer’s business. (Ahonen & Vossi 2016.)

2.2 Blurring boundaries

Prahalad and Krishnan (2008) bring out the notion that we have finally reached the point where the confluence of connectivity, digitalisation, and the convergence of industry and technology boundaries are creating a new dynamic between consumers and firms. Kokkonen and Valjakka (2016) continue that when the customer is perceived in the center, the firms will invent many different solutions that can vary between companies. The value creation lies in the individual consumer experience and not in the produced goods themselves. Firms that do not consider to be in the service sector can be perceived so in many cases, meaning that the industry boundaries are fading which gives an opportunity for small and agile firms to move from one to the other to escape mature markets or look for new opportunities.

According to Lusch and Nambisan (2015) service innovation in this digital world will fasten and increasing amount of innovation will be intangible, digitally enabled, and created or co-created around social phenomena. The concept of blurring boundaries is gaining popularity and refers to a practice of products and processes that firms are shifting into services as well as across industries. Especially
information technology is an important reason why the boundaries are blurring across different industries. The boundaries of companies are also blurring as cooperation is beginning to be a norm rather than an exception.

The world as well as the ways to organise have changed from past governance and the ability to live in uncertainty. Thereafter, learning and communication within the organisation and its environment are in the center. These types of organisations are agile but it is impossible to control them perfectly. Those businesses that function in unpredictable environments must develop new strategies and tools to support their ability to adapt. In practice, this can mean that the company is perceived to be light and it acquires complementary knowledge or skills through networking. This can limit the company’s possibilities to control the key resources. (Talja & Heikinheimo 2016.)

Conducting business in different interfaces brings challenges to co-creation because the parties must find a common language and ways of working. Within the organisation it is important to stop and think if the challenge or objective is understood along similar lines. It is also important to contemplate if someone in the organisation is guiding the joint operations or if it is beneficial to call an expert from outside to help in that. (Seppälä et al. 2016.)

An increasing number of individuals are conducting work outside their area of expertise and across organisational boundaries. In addition, the participants’ roles are changing constantly. The ones involved, need a common vision, what is it that we are aiming for and why. The most suitable and meaningful way of practice is usually found through experiments. Colliding different points of view might itself bring new solutions. (Lappalainen et al. 2016.)

2.3 Elements of co-creation

Co-creation is a controllable process. By controlling interaction, it is possible to guide the tasks at hand towards a common goal. It is vital to ask and question the objectives and whether they have been committed to and to define the roles. When the common good is found, the resources to implement the ideas can be found with
less efforts. When the partners who are collaborating feel that they receive something in return it is possible to identify the need as well as the solution. The creation of a combined resource base and the courage to move away from the traditional roles of an organisation is a prerequisite for the success of co-creation. (Seppälä et al. 2016.)

Prahalad and Krishnan (2008) point out that any company must focus on one consumer experience at a time even if their customer base would include millions of individuals. This view may seem rather impossible when a firm deals with that number of customers. However, this is possible if the firm provides a platform around which customers can co-create their own experiences.

In addition, there are also other methods for co-creation as in building capabilities to access the global network of resources to co-create unique experiences with consumers. Moreover, it is vital to understand that it is not necessary to own all the resources but it is enough to have an access to sufficient resources and the knowhow of how to utilise them properly. (Prahalad & Krishnan 2008.)

Furthermore, the methods of co-creation may seem redundant if the processes are not connected to the skills, attitudes and orientations of the managers. This refers to the fact that ordinary methods such as physical location, technology and materials are not enough to gain competitive advantage but firms should pay attention to the approach to business processes that connect these resources and consumers with efficiency and flexibility. (Prahalad & Krishnan 2008). Kokkonen and Valjakka (2016) state that it is extremely beneficial for firms to concentrate on time. Firms should be agile so they could transform their business models based on the changing market environments as well as the ever-changing customer needs. Moreover, increasing amount of value will be created when the time-to-market and time-to-profit exists. This is important if one desires to act faster than its competitors.

When stabilising a separately developed service, it is important that the service has already found its customer base and received positive feedback from the users. To stabilise a business model in a long-term it is vital to map out the cooperative partners and engage them in activities for the long run. This requires trust, planning and realistic evaluation of resources from all parties involved. (Seppälä et al. 2016.)
2.4 **Benefits and challenges of co-creation**

It is also central in gaining new sources of competitive advantage (Prahalad & Ramaswamy 2004) and investigating the new opportunities it can provide (Prahalad & Ramaswamy 2004, Frow et al. 2015). Moreover, the collaborative innovation with consumers has the possibility to become a cost-efficient or even costless way of innovating but only if it is managed properly (Seppä & Taney 2011). In addition, Hatch and Schultz (2010) showcase that some of the content that the case company/stakeholder engagement produced turned into product and service improvements and thereby into value.

The vitality of co-creation can also be expressed with the help of the healthcare sector when a patient gets a cardiac pacemaker installed. In these types of situations, it would be extremely beneficial if someone could monitor the heart even when the patient would leave the hospital and travelled a long distance. The significant factor is that both, the patient and the doctor could decide on the treatment remotely together, where the patient played an active part in the process and the value would arise from the co-creation experience (Prahalad & Ramaswamy 2004). Similar cases of co-creation are showcased through the chosen digital health startups for this research.

Despite the many benefits of co-creation, there are also challenges. According to Heinonen and Strandvik (2015) one of them is the notion of how value is created because this might differ from the provider’s perspective compared to the customer’s perspective because especially customers can differ a lot (Grönroos et al. 2015). In addition, both parties do not necessarily acquire the same goal from the co-creation activities or benefit equally from the process which can also create difficulties therefore, it is hard to find a situation that both participants are on the same page. Co-creation should be intentional, not completely spontaneous. It has also been described as a constant ‘mystery’ especially for managers starting from the question of what should be co-created, by whom and what are the goals or results of the co-creation activities. (Grönroos et al. 2015).
3 BUSINESS MODEL

According to Osterwalder et al. (2005) the popularity of the topic of business model is relatively young phenomenon since it gained recognition only after the 1990s. There has also been a lot of confusion around the topic stemming from the fact that different authors have written about it meaning various aspects. In literature business model can stand for numerous factors such as types or parts of business model or real world examples and concepts of a business model. The evolutions of the concept of a business model started from simple definitions growing towards real models that are applied in management. Overall, business models aid in capturing, visualising, understanding and communicating business logic.

3.1 Definition of business model

Sako (2012) brings across that business models are essential for converting new technologies into commercial value. They can also generate added value which is based on long-term strategies and clear business objectives (Stanimirovic 2015). According to Osterwalder et al. (2005) business model is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm. Bertels et al. (2015) describe that there has been an increased interest in business models from the academics as well as from the practitioners. The components within various business models overlap but include value proposition, customer aspect, infrastructure aspect and financial aspect (Stanimirovic 2015). Johnson, Christensen and Kagermann (2008) state that a business model consists of four elements that create and deliver value to the customer. The most important of these elements is customer value proposition that helps customers in finding a solution for their problems. The second element is a profit formula that defines how the company creates value for itself and to its customers. The third component is key resources that refers to assets, such as, people, technology, product, brand and channels that are needed in delivering the value to the customer. The last element is key processes that refers to the operational and managerial processes that allows a company to efficiently repeat and increase in scale.
Kajanus et al. (2014) describes business model as a means between the abstract and practice within strategic management and business. Similarly, Osterwalder and Pigneur (2010) offer a way to systemize business model invention, design and implementation. They consider business model as a bottom line of how an organization conducts business. This approach is called the Business Model Canvas and it can be used by companies of various sizes to describe or even challenge their current business models. This practical and visual canvas consists of nine interrelated building blocks that together form a concise overview. These blocks are referred to as customer segments, customer relationships, value propositions, channels, key activities, key resources, key partners, cost structure and revenue streams. Euchner and Ganguly (2014) describe business models in a simpler way and refer to them as means by which companies either create or sustain growth. It is worthy to mention that firms that focus solely on creating customer value without taking into consideration the competitive advantage might face an opposite and more negative outcome (Euchner & Ganguly 2014).

3.2 Business models and co-creation

The topic of business models is somewhat vague in a sense that there is no exact formula of how to design a successful business model and even the definitions vary between the authors (Kajanus et al. 2014, Simonse 2014). However, it is certain that no matter what industry a business operates in and what business model they are utilizing, those models must be modified quite often because of the changing environment in terms of the competition and this leads to business model innovations (Stanimirovic & Vintar 2015). Company-centric business models are the ones that often fail to meet the ever-changing consumer needs (Kohler 2015). Bertels et al. (2015) state that companies are more and more aware about the fact that to sustain growth they must innovate beyond their existing business and outside their familiar markets and core competencies. Whereas this can be the key to extreme success, it is also a highly risky approach. Despite the fact that business model creation can be difficult and even risky, the innovation of the business model is in many cases the key to capturing value (Euchner & Ganguly 2014).
According to Euchner and Ganguly (2014) business model innovation is not just building new capabilities but rather innovations that construct new markets or interrupts the competitive advantage of key competitors. Furthermore, existing firms are under pressure to reinvent their business models as company borders are dissolving and the value creation process is changing. According to Anker et al. (2015), companies should embrace the consumer-created activities and let go of control whereas in many cases they are trying to control these situations. Koehler (2015) agrees that many firms are including a crowd in value creation and some are turning crowdsourcing projects into platforms with an influential business model. Famous for its crowdsourcing activities are, for example, Lego and Quirky that have chosen consumers as an essential part of their value creation processes. Crowdsourcing will turn users into creators and the firm will receive more insights about the real needs and wants of the customer. The benefits of crowdsourcing include the fact that the firms might be able to reduce their fixed costs, such as, salaries of employees if some of the ideas derive from the consumers. If a firm manages to build this type of crowdsourcing platform, it is very unlikely to be copied by a competitor. (Kohler 2015).

### 3.3 Business Model Canvas

Osterwalder and Pigneur (2010) consider the Business Model Canvas as a blueprint for strategy. It has been widely used all over the world from startup companies to many major corporations and different governmental institutions. This concept allows the user to describe and manipulate business models to create new strategic alternatives and innovate successfully. This model makes it possible to evaluate and compare the functions of a company. This model consists of nine building blocks that cover the topics of customers, offer, infrastructure and financial viability. This model is also vital regarding this research.

The topic of customers includes the block of *customer segments* which is in the core of any business model because without any profitable customers the business is heading into a failure. In the BMC, customers can be divided into segments to serve each of them better. *Customer relationships* is a block that describe the types of relationships the company wants to establish with each customer segment. Through
channels, the company communicates and finally reaches the above-mentioned customer segments in order to deliver the value proposition. (Osterwalder & Pigneur 2010.)

The topic of offer includes the block of value proposition that describe the products or services a firm has to offer that create value for a specific customer segment. This is also the main reason why customers choose a company over a competitor. The value proposition creates value through a mix of elements serving a specific customer segment. The value can be quantitative or qualitative. (Osterwalder & Pigneur 2010.)

The topic of infrastructure covers the block of key resources that include the most important assets required to make the business model work. These are vital to any business model and they can vary depending on the business model at hand. Key activities refer to the most significant actions a firm must take in order to operate successfully. Key partnerships describe the network of suppliers and partners that help the companies to optimize their business models, reduce risks and acquire resources. (Osterwalder & Pigneur 2010.)

Finally, the topic of financial viability includes the block of cost structure that describe all the costs incurred to operate the business model. These costs can be calculated after defining all the above-mentioned blocks. In addition, the revenue streams building block represent the cash a firm generates from each customer segment. (Osterwalder & Pigneur 2010.)
3.4 Business models in the digital health sector

According to Stanimirovic et al. (2015) one of the most neglected, yet vital areas regarding business models is the one of healthcare. In addition, the research in the field is very limited highlighting only selected aspects of healthcare business models. The lack of business model innovations in the field of healthcare keep the industry expensive and unreachable to many (Hwang et al. 2008). Osterwalder et al. (2005) point out that business models can be imagined as a link between planning and implementation. Steinberg et al. (2015) state that within the tech industry new products can reach markets in weeks but uncertainty around monetisation as well as competition can limit success of the product whereas many medical innovations can require decades of development as well as large monetary expenses. These two industries together form digital medicine products that require thorough navigation of two very distinctive landscapes. The evolution of the technology sector has opened new innovations for medicine as well, now almost anyone can try to enter the field of digital medicine.

Casadesus-Masanell and Ricart 2010 state that “the exercise of designing new business models is closer to an art than to a science.” (Simonse 2014). Many leaders
in the tech field understand the potential opportunity and have committed to pursuing the field of digital medicine. Despite the fact that the field is growing, it is still in the beginning stages and the dominant business models have yet to emerge. Many have started to develop several mobile applications for patient engagement. These applications are becoming increasingly smarter, multi-functional and user-friendly and they are in many cases directed towards the consumers rather than the doctors which makes healthcare more accessible to everyone. (Posada 2017.) Akili Interactive Labs Inc. (2014) has utilized this and entered into an agreement with Pfizer Inc. to test the ability of mobile video game to detect cognitive differences in healthy elderly people at risk of developing Alzheimer's disease.

A few existing companies in the digital medicine space suggest that this new industry will emerge as a mixture of characteristics from the existing industries of biopharma, medical devices and digital technology industries. These industries reveal the vital building blocks of a digital medicine business model. These blocks are referred to as the product, technology, user/customer, data, delivery, validation and economic model. Each of these blocks include several questions and concerns that companies in the digital medical industry must consider. These firms must be smart and flexible in borrowing the best across the industries and fitting that to their business model. The prediction is that in the next decade, there will be multiple successful business models in the field. (Steinberg et al. 2015.)

According to Hwang et al. (2008) new business models in the sector of health care do not arise without challenges. These new models might fragment the delivery of care as the coordination of care in such a system is critical, and the importance of health IT cannot be stressed enough. Another challenge is that innovations usually require a market that consumers have incentives to buy in. Therefore, an issue in many cases is the lack of retail market, which is a necessity to create a sopping behavior.

The medical device business models have a lot in common with those in the biopharma industry with the difference of scalability as the product development is less risky and rewards are usually smaller. The success within this industry is based on the efficacy and safety of the device. Medical device companies can have more
difficult time in capitalizing on their value as the revenues from devices can be lower and they might have to spend a lot on sales and administrative costs. Technology business models have very little in common with biopharma or medical device industries. This is an opportunity for digital medicine to define a completely new industry. This industry differs from the two above-mentioned by how success is defined, usually it is very subjective but still investors judge most companies based on cash flow. (Steinberg et al. 2015.)
4 SUMMARY OF THEORETICAL FRAMEWORK

The radical change in relations between a firm and a customer is the backbone of co-creation. Customer is no longer a passive receiver of a product or a service but an active value co-creator in the co-creation process together with the firm, end-user and other stakeholders. This requires changes from firms and their original business models. In this research, the basis for a business model is the Business Model Canvas, which consists of nine different elements that are referred to as value proposition, customer segments, channels, revenue streams, customer relationships, key resources, key activities (processes), key partners and cost structure.

In the centre of co-creation is also digitalisation, blurring boundaries of technology and industries as well as changing market environment and customer needs. The topic is central especially within the healthcare industry, which focuses on the digitalisation of services. With the digitalisation of services one can save monetary resources as they do not require physical meetings with customers. In Finland, there are many startups in the digital health industry. Co-creation can bring several benefits for startup businesses but it also carries some drawbacks. However, researchers suggest that co-creation is in fact a controllable process. By controlling certain elements, it is possible to direct the duties towards a common goal. These elements are, among others, aims and the commitment to those, defining roles, combined resource base, utilisation of know-how, the process of focusing on one customer experience at a time, building a common platform, the knowledge of leaders, trust, planning and realistic evaluation. The summary of the theoretical framework can be comprehended from the figure 2.
Figure 2. Summary of theoretical framework
5 METHODOLOGY

In this chapter, the applied research method as well as the empirical data analysis are described. Furthermore, the aim of this chapter is to present arguments to support the selected form of research methodology in order to assure that the theoretical, as well as the empirical evidence are consistent in regards to the research phenomenon.

The objective of this study is to examine the impact of co-creation on a digital health startup’s business model. However, existing research on this topic is still in its infancy, making the literature relatively scarce and fragmented (Olsen 2012). Due to the limited research conducted in the impact of co-creation on business models, the research phenomenon is approached through a qualitative method.

Janesick (1994) states that there are many characteristics in qualitative research design, including the fact that it is flexible and therefore capable of adjusting to what is being learned during the phase of data collection. In addition, it is holistic in its kind and strives to understand the whole. It also aims to comprehend the phenomenon or the social setting without making predictions about it. Furthermore, qualitative design requires that the researcher is intensely involved in the research and becomes the research instrument. It also provides opportunities for description of the researcher’s role and one’s biases. (Polit & Hungler 1999.)

5.1 Method of empirical inquiry

As this study aims to find out the impact of co-creation on a startup’s business model, the method suitable for this research is a qualitative case study. Case studies are common in social sciences but also in economics (Yin 2009) and it is appropriate when the focus is on a contemporary phenomenon within a real-life context (Yin 2009). Furthermore, case study is not a method but rather a way to approach a phenomenon. It is usual for a case study to provide intensive and detailed information from an individual case. One can use different methods when collecting data, typically the goal is to portray a phenomenon. It is essential that the data at hand forms a whole and this in particular is referred to as a case. The strength of the case study lies in its ability to give a comprehensive view (Saarela-Kinnunen &
A case study is looking for answers to questions how and why (Laitinen 1998, Yin 2009, Saarela-Kinnunen & Eskola 2015). In addition, the research questions formed can result in better findings through a case study.

Usually the case is chosen based on an agenda towards a theoretical or a practical interest towards a topic. (Laitinen 1998). Yin (1994) elaborates that the case study can be, for example, about a family, an individual, an organization or a community (Saarela-Kinnunen & Eskola 2015). This research is part of a practical case project in the healthcare industry and it focuses on the effects of co-creation on a digital health startup’s business model. Stoecker (1991) states that the common features for a case study are the emphasis on theory and the involvement of the researcher. There are many ways to gather data from a case study which makes the study more flexible (Yin 2009). Various documents, notes, recordings, interviews or experiments can be forms of material.

As much as a case study is suitable for this type of study, it has also gathered some criticism. The most common criticism towards a case study is that it is relatively easier for a researcher to provide ambiguous, unfair or biased views that affect the findings negatively, which is unlikely to happen if the method used is either experiments or surveys. The other methods are slightly more popular and provide specific guidelines that are easier to follow which can prevent in making indistinct conclusions. (Yin 2009.)

5.2 Data collection and method of analysis

As the purpose of the study is to understand the impact of co-creation on a digital health startup’s business model, it is beneficial to conduct semi-structured interviews with people who have experience from startup’s within this particular industry as well as from co-creation with hospitals, doctors, nurses or patients and end-users. These types of semi-structured interviews are called theme interviews and they are centered around quick concepts that easily move from one topic to the next and they tend to be open ended questions (Olsen 2012). These interviews move forward with certain premade themes that there are two altogether: General questions about the startup businesses and co-creation and then questions based on the Business Model
Canvas and co-creation. In addition, these theme interviews are a more systematic and more preplanned method compared to unstructured interviews (Olsen 2012).

The startups involved in the study are Near Real which is based in Oulu and Buddy Healthcare which is based in Helsinki. Both startup businesses involved acquire different experiences regarding co-creation which is why it is also beneficial to utilise these two for the benefit of this study. In order to gain the most out of the two companies, two people are chosen from each startup to take part in the study.

Before the theme interviews, two initial unstructured interviews are scheduled including the two participants from each startup together where the four participants can answer any background questions about their product or service and explain more about their business. The first meeting is with Near Real on the 14th of November physically in Oulu, including only one participant from the business and the second on with Buddy Healthcare via phone on the 28th of November 2016 with both participants. The participants did not require any initial knowledge about the final theme interviews except to agree on a date, time and a place as well as to understand the topic of the study.

All four theme interviews are similar to each other and the structure of the interviews can be found in the appendix 1. The final theme interview with Near Real is through their online service on the 10th of January 2017 and with Buddy HealthCare at their office in Helsinki on the 17th of January 2017. Each participant is interviewed separately.

Overall the interviews conducted can be considered successful, the participants and the researcher were equal and the mood of each interview was relaxed. However, there was no additional small talk or many follow up questions in between the interviews as the researcher is new in the research position and was quite nervous in the beginning. After the interviews, the researcher made sure she had the right to ask follow-up questions in case they were needed after the analysis.

The theme interviews lead to transcript which refers to carefully transferring the recorded tapes into text version (Olsen 2012). The interviews were recorded with the
permission of the interviewees and they were written down as soon as possible after the interview. One interview ranged from half an hour to one hour. These transcripts are around 45 pages long altogether and as the interviews were conducted in Finnish, the transcripts are also in Finnish. The task of transferring the recordings into text was very time consuming and the dialect made it somewhat harder. After the transcripts it is time to start coding and making the database of connections between the various terms in order to make it more purposeful. The received data will be analysed through content analysis.

Four participants take part in this study from two different startup businesses. There will be no figure regarding the interviewee participants and their roles in the study as it can influence their anonymity because the startup businesses are small in size. The researcher has promised the interviewees that they can stay anonymous throughout the study. However, it can be mentioned that the roles of the participants were Innovator, Chief Operating Officer/Chairman of the Board, Chief Executive Officer/Founder and Chief Operating Officer/Co-Founder.

5.3 Content analysis

A common approach to qualitative research method is that it seeks to find ways, similarities or differences from the research data. In this study, the research method is content analysis which one can utilise to analyse written and oral communication and which allows one to look at the purpose, consequences and connections of various events. According to Cavanagh (1997), content analysis is not merely a technique, but it is about the meanings, intentions, consequences and context. (Latvala & Vanhanen-Nuutinen 2003.)

Cavanagh (1997) states that the progress of the content analysis process can be roughly divided into the following stages: selection of an analysis unit, orientation to the research data, deduction of the research data, classification and interpretation of the research data and the evaluation of reliability. (Latvala & Vanhanen-Nuutinen 2003.) In this study, the processing of the research data began with transcribing. When interviews are in verbal form they can be returned during the phase of analysing. Thereafter, an analysis unit is selected, which can be a word, a sentence, a
part of a sentence, a set of ideas or a combination of words (Latvala & Vanhanen-Nuutinen 2003). Interviewees' interview data was kept by codes (H1 to H4) as separate entities.

According to Cavanagh (1997), the research data is subject to research questions. This stage is called abduction. The starting point is the original expressions of the interviewees. After abduction, the data is grouped in which the differences and similarities of abducted expressions are searched. All the terms that acquire the same meaning are combined into the same class with the name describing its content. Here an interpretation can be used. During the third step the purpose is to combine classes of same value that creates an upper category. This can be continued by abstracting all classes into a category that includes, for example, the impact of co-creation on the digital health startup's business model. (Latvala & Vanhanen-Nuutinen 2003.) An example of content analysis is presented in Appendix 2 (in Finnish).

5.4 Overview of the case companies

The two startup businesses involved, both from the healthcare sector are utilised for the benefit of the study. Both companies involved are relatively new ranging from one to two years in age and are located in the capital region and in Oulu. They acquire services that are very relevant in today’s healthcare sector, also when considered globally, which is why they also conduct business overseas, mainly in the United States of America. Their services vary from patient centric surgery platform mobile application to high quality online video system and telemedicine devices. They are both in their own way making healthcare sector more comfortable, easy to use and accessible. They agree that co-creation is still in the beginning phase and needs more practice from all parties involved but when the company seizes the benefit of particular project of co-creation, they are ready to adjust their products or services as well as business models if necessary:

"... If we realise through co-creation that we should act differently so that the service or action would be something that they would pay for or if it was beneficial in another way, then for sure we would adapt our service and business model to that direction."
The customer base of the startup companies consists from players in the healthcare sector, as in university and private hospitals, focusing on children’s hospitals as well as other clinics, municipalities and cities in Finland and overseas. Their employees are experienced in IT, engineering, design, business development as well as other fields but they have not hired any healthcare professionals into the team, which makes co-creation even more valuable.

“From a startup’s point of view, co-creation is the only way to get into the hospital. It is important because companies do not have experience from the hospital environment as a work environment or the work that is conducted in the hospitals.”

According to the case companies, co-creation is vital in getting them into the hospital environment and also in understanding what are the specific issues doctors are struggling with on a daily basis. The startup does not come up with the issue and solution but both parties should be actively involved in this. It can also work as a factor that commits the potential or current client into the project but it is very important to understand that co-creation exists for the benefit of both parties, not just one of them.
6 FINDINGS

The findings will be presented through a content analysis as demonstrated in the picture 2 below.

![Figure 3. The findings derived from content analysis](image)

6.1 Impact on the value proposition

6.1.1 Producing a product according to customers' needs

Through co-creation it is possible to produce a product that is according to the customer's needs. It can result into a manufactured solution that solves customer’s problems and fills their expectations and objectives.

The end-user’s value creation happens when collaborators and customers communicate their needs, as an example, one does not need to guess the end-user’s challenges because development, improvement and communication happens with nurses who are aware of the needs of the end-user.
“...we have never had to guess... we have managed to get the end-users to share their challenges with us since the day one.” H2

One of the central elements in producing the right product is to work in an environment where you can test medical devices in a genuine setting. This will make the solution more user-friendly and thus, increase the value for the end-user. Startups listen needs and desires of their customers by having physical meetings and by simply asking what aspects the company should take into account. When dealing with an important customer, it is possible for startups to emphasise certain functionalities of the solution and to prioritise them if necessary, if they were not originally important from the company’s point of view.

“... In certain time frames by having meetings with them to see if their needs are being fulfilled. Are there any new ideas for further development, thoughts or functionalities that we should take into account... it is about prioritising... if the customer is seen very important, then it will be prioritised (regarding the functionality)” H1

Hospitals have really aspired to use up-to-date systems because they face an external push to modernise processes and digitise their services. By doing this, they get closer to their vision, for example, being the most intelligent hospital in the world. All this requires better digital services. Often, startups solve problems with which doctors and nurses are struggling with every day, making collaboration more valuable to both parties. Frequently, professionals admit that engaging in co-creation may be difficult because it should make them really think about their issues and help in giving valuable feedback to startup companies.

“One should start with the professionals that work there. To get them on-board and engaged so that they really thought about it and gave valuable feedback... what is the problem.” H1

”What are the issues that doctors and nurses deal with every day? To get in and solve them.” H1

An ideal situation is when a company searches and solves problems together with the customer. The customer should be an active participant by letting the company know what works and what does not in the early stages of the process. By co-creating a solution for a problem is the most efficient when the end-user is also involved in the
process, as an example, a nurse or a doctor. Furthermore, it is required to involve someone in the process who is aware of the context behind the treatment processes.

“... it would be the most efficient if we could also involve the end-user, either a doctor or a nurse, so that their problems would be available to really co-create – to co-create a solution for that specific problem.” H1

“... I don’t think that I can come up with the best solution in the world to a treatment process without someone that knows the context.” H1

The interactions happening in co-creation can be short, vague or clear and defined. An example of the latter was with several nurses and doctors who came to the TestLab to test, give feedback and listen to ideas. The time was spent by having discussions around development ideas regarding their needs and technology as well as the aspects the technology and the service could make possible.

"I will not tell a customer that this is your problem and here is a solution but firstly we would find out the issues together and on the other hand we would seek the possible solutions. The customer doesn’t have to code but actively participate and tell what is good from the very beginning. This is exactly what we need." H3, H4

Value creation in co-creation takes place where the solution is used, i.e. in the hospital or at home for patients and parents. It is important to see the environment and who is using the solution so that the company can formulate easy usability for the solution.

Proceeding by doing is one of the vital aspects of co-creation. It is used especially in cases of further development in which the solution is first taken into a ‘sandbox version’. After the first version is made, it will be tested and finally the decision of further development is made. Before all this, there is an evaluation of the possible workload and if the service is worth implementing.

"It is used a lot. We have a sandbox version of our service..., if we further develop something we will take it first there and create the first version of it, test it and see how it turned out and decide where to take it next.” H2
"before that ...we have some estimation of the workload and the sensibility of it, that is it worth it to actually implement it in the first place and if we decide to implement it we would make some sort of version of it first." H2

Identifying and coordinating stakeholders’ objectives can be challenging. When a startup and a hospital are working together, money is always involved but both parties need each other. The participants should agree on the goals for co-creation early in the beginning of the process. One should be open about what happens to make the pilot successful and the company would know what is expected of them.

6.2 Impact on the customer relationships

6.2.1 Physical and remote communication

Companies are doing their best to automate processes and communicate through physical touchpoints as little as possible. However, in the beginning it is necessary to communicate face-to-face, which was said to happen remotely 99% of the time. If possible, by utilising the company's own remote access service. At the first meeting, it is important to have time to think and reflect on problems and solutions. The advantage is that the startup can sense the hospital personnel’s interest towards the solution better and they are also able to present the solution better to others compared through a telephone call or other remote channels. Local connections are usually handled in face-to-face meetings.

“In the beginning we had to communicate face-to-face – by using remote access services of course.” H1

"In the first meeting we can be face-to-face and there is no hurry – even video negotiations are nice but, through a face-to-face meeting we can ponder problems and solutions with more time.” H1

Especially communication can be helped if the company communicates properly from the very beginning and travels to another city physically when it is needed. Physical observation throughout the whole process and expressing interest helps to reach the target market.
The process of implementing a solution is speeded up by being actively present and working together in collaborative situations. In addition, it can also turn out to be beneficial to meet up with the partners in other times than the project itself.

"Our solution includes information... it has been checked and read many times that everything is correct... ... we have went there to be physically present and actively participating and looked at the solution together, all this would speed up the process." H4

Frequent communication with customers is particularly important before, during and after the piloting phase, to ensure optimum fit to customers’ requirements. In addition, prior to the commissioning phase, the nursing staff should be familiar with the nurse's user interface and clearly understand its value. Channels are usually used in the most natural way with each customer.

"Communication with customer is probably the most natural... It depends on the case. And all channels are being utilised.” H3

In the beginning, communication can be a daily activity but after that phase it is more likely to be executed monthly or even less, depending on the needs of the customer.

"... if we are integrating a new remote access device into our system, then it can be a daily activity... when that particular job has been done, it can be monthly or even less.” H1

“...actions are according to the needs.” H1

In the implementation phase of the solution it is beneficial to maintain extremely close contact. The frequency of the contacts can vary between the partner, some can be dealt with emails and virtual sessions, whereas others can require weekly meetings and participation in their events.

"... in the beginning... very closely... when the implementation phase approaches we try to maintain very close contact with them.” H3
There are cases when the startup initiates more frequent communication because of their lack of know-how in regards to the context. The most common reason for this is that usually the startups do not have any medical professionals in their payroll, which means that they rely on the hospitals more often. It is probable that the company’s aim would not be possible without co-creation and consequently the inability to enter the healthcare context.

"Well, if we talk about customers we can say that communication is very frequent. At the moment we don’t have anyone inside our company who would be familiar with the healthcare context. So, we don’t have expertise from the healthcare sector which makes the communication with them very important. In practice, without co-creation this could never work out and how frequently… well maybe weekly. It is probably a good number towards the customers but then when we talk out the general environment, like competitors, partners and other similar companies it is probably monthly.” H4

Interactions where the company’s representatives come to meet with the customers are considered quite valuable. In these situations, it is useful that the customers are able to describe the routine of their everyday life and the company can create certain hypotheses so they can validate those situations. In addition, co-creation requires a lot of discussions and sales.

"When we have sat down with customers, those situations are good... they can illustrate the whole daily routine and when we have had certain hypotheses we have managed to get them validated in these situations. They are valuable.” H3

Proceeding by doing, demands frequent communication and meetings. Even though companies emphasise face-to-face meetings especially at the beginning, virtual and working at different times are a lifeline for a startup company.

"... sort of proceeding by doing, takes the charge and really starts doing but it requires communication, frequent meetings, so that processes progress...” H4
6.2.2 Activation of customers and end-users

Co-creation can make customers more active. It lowers the threshold to introduce technology service solutions and makes them more approachable. Consequently, the resistance to change decreases.

"Yes...it has activated the customer’s process... they are more ready... as an example, we could avoid unnecessary traveling... we could go through clinical communication interactions by utilising this kind of technology and service... it has lowered the threshold and brought it more down-to-earth and less mystified aspect." H2

Customers want to be active and participate by sharing their issues that they are dealing with. Smaller clients themselves express what improvements or additions they prefer.

"... customer is involved in co-creation because they have a real problem and because they want to participate. They want to be active... customers feel that this is their thing.” H3

"...in the case of smaller clients it comes from them, this is not working as we would have liked it to work, they would like this here and here and an addition here and improvement there.” H1

Possible potential customers share their wishes, dreams and needs they have so that the company can respond to them with an offer. The startups are usually contacted regarding the usability of the service as well as customer feedback (what works, what does not, what is good, etc.) and through service inaccuracy and additional functionality requests. More commonly, the problem is that the end-user is unable to use the service or the end-user’s device is outdated. Through these technology-related discussions, customer relationship develops and both parties learn to know each other better.

"... if they have those previously mentioned additional functionality requests or some problems regarding the service they usually have a negative point of view in the beginning, but this is one of the options.” H1
”... a lot of requests about how flexible is the technology and through these discussions the customer relationship develops and we learn to get to know each other better.” H1

“Customer participates in using the service and often gives feedback...” H2

Co-creation helps to activate end-users, such as parents of pediatric patients, mostly in responding to feedback. It is common to build, develop and discuss more about the solution with nurses because they know what parents want, for example, feedback has been asked for parental guidance on the mobile application.

”...parents have given direct feedback, as an example, that this is healthcare of the century and this is what it should be like and this should be expanded to other areas and not just those that we have tested. So maybe we have gotten the parents... more activate so that they have responded to feedback forms that we have regarding this service... they have wanted to give feedback regarding the solution and overall we have only received good feedback. I don’t know if it has made them more active in practice.” H4

“... we have built and developed this quite far with nurses... we have discussed with nurses a lot about the service and of course they know what the parents want so it has been quite a good approach in my opinion.” H4

6.2.3 Equal participation

Equal participation is perceived natural and it is very important that both parties participate equally in the process of co-creation. It is possible for a startup to be seen as equal when partnering with a bigger institute, such as a hospital. Equal participation is a prerequisite for challenging each other as well as listening and learning from one another. It is beneficial for both parties to bring up their thoughts and other development ideas to create value.

“... We are equal conversation partners and equal like participant bringing thoughts and development ideas to this and yes it is very important.” H1

“... It has been very natural ..... equal participation is very important and it is very important that both parties are equally involved.” H4
“... Everyone has taken a very proper and equal attitude. Yes. And had been ready to listen and learn and challenge and at no point did anyone have the attitude that 'well hi what are you trying to do' or something like that.” H2

One opinion from the interviews differed from others by noting that equal participation could not exist because someone always has their own agenda, either the client, company, financer or the researchers. Furthermore, company has a need to obtain money as soon as possible, when the client on the other hand can stretch the time for the payment as long as possible.

6.3 Impact on the channels

6.3.1 Assistance in sales

Regarding the sales of the service solution, active participation from the very beginning of the process, such as meetings organised by hospitals, and ideation events, are beneficial because they can have a positive impact on sales. When startup’s products and services are new, the most important factor is to take part in piloting projects that can prove the value of the solution to the hospital and successful cooperation can help in assuring that co-creation continues in the future. Through co-creation, companies can learn faster whether hospitals or healthcare services were interested in the solution. Various university hospitals' testing projects can also act as a door opener even abroad.

"because we have here in Finland completed a testing project in two university hospitals, it has really worked as a some sort of a door opener in other countries as well that we have mentioned that we have worked with university hospitals before already..” H4

If the opportunity for co-creation arises and the company is able to solve an issue within the hospital, it is seldom at a stage where another company can interrupt the process. In addition, good relations with hospital staff are valued, as well as discussions with potential decision-makers about the solution, its price and competitive advantage, as these enable companies to get inside the complex hospital environment.
"On the other hand, when we co-create we do have everything the customers require... if this product and the problem that they have decided to solve through co-creation is real and they want a solution for it, then I really cannot imagine that another firm would come between us at stage anymore." H3

"We have tried to develop great relations with everyone who are part of the hospital environment, who we have talked to and we have always done great job so that must have been a channel for us to get inside the hospital context than if we had just gone on a sales trip. “ H4

Co-creation has the potential to take the startup on prospective sales meetings. However, it is yet to be exploited in pure sales domestically as well as overseas and the impact on commercialisation of the solution is yet to be seen. Regarding financial discussions, co-creation can act as a leverage.

"From the sales point of view... when we manage to discuss with people who are decision-makers in business. Those who ponder in the potential client organisation about what we should do and how, how much does it cost, what is our competitive advantage compared to our competitors or what competitors are currently doing. When we manage to get into a discussion like that, we are the strongest.” H2

Companies are struggling to decide whether to sell their product or service as a generic version with no hospitals-specific information, or customised. This can also have implications for the company’s business model. Often, the company stands out because of the fact that they customise their products to every customer and end-user.

"At some point we have thought about ways selling our solution... maybe the way we differentiate ourselves from competition is that they often have very generic preparation and rehabilitation guides where as we aim to create customised guides for patients and hospitals so that they are more personalised.” H4

The startup companies have several options for sales. With a new product, the startup usually utilises direct sales with various potential clients. There is a possibility to automate sales and distribution to make the solution available over the Internet. Generally, healthcare services require Business to Business (B2B) sales, discussions and understanding of the case and the process.
"... Sales process proceeds in a way that a company needs to first get into a piloting project in which the company proves that they can provide value to the hospital with the help of their product or service and after this discussions related to acquisition begin. The company has an ongoing discussion with one patient information system supplier, regarding if the company could integrate in them and if they could act as a distributor for the company.” H3, H4

6.3.2 Improvements in reputation and status

Overall, co-creation has a positive impact on a company’s reputation when compared with competitors, especially if major players are involved in the process of co-creation. Communication can, in its own part, improve the company's reputation, for example, in situations where a startup company has travelled to another location to be physically present at the hospital.

"Has most definitely increased... We have heard... that we have managed communication quite well. The hospitals have complained that often they are left alone with the research or the project... We have received many thanks about... that we have travelled there (to another city)...” H4

With little evidence so far, co-creation also affects the startup’s position positively. It is not completely certain that co-creation positions the startup higher than its competitors but they are at least at the same level. Through co-creation, the startup can access the target market better and this brings competitive advantage. In addition, it makes it possible to take into account more than one stakeholder group. According to the slight experience with co-creation so far, it can be said that it helps the companies to get closer to their target customers and it also helps them in building a product that solves customers’ problems and fulfils their needs.

"... we are in a better position if we know exactly and when our product has been tested that it fulfils our customer’s expectations.” H3

6.3.3 Increasing credibility

Operating in the healthcare sector as a startup needs confidence building at different levels. Co-creation increases credibility in discussions with foreign partners and it makes communication possible at an early stage. In addition, co-creation brings
credibility to the story as a startup company and especially in Finland, working
together with university hospitals is highly valued.

"... we have developed this together with OYS, HUS, American Children’s
Hospital in the USA, so yes this brings credibility to us that they see that we
haven’t just pulled this idea out of a hat." H3

One of the biggest benefits of co-creation is that it helps startup companies to enter
the hospital environment and through this the co-creation partner helps the startup to
build credibility. Also, being involved in the test laboratory together with the
university hospital experts increases credibility. These piloting projects allow the
company to prove the value of their product or service to the hospital.

"So our involvement in the university hospital’s test laboratory and working
together with university experts for the same solution, increases our credibility
in the eyes of our customers to another level." H2

Furthermore, regardless of their customers, startup companies must be realistic and
honest in what they are capable of providing. Right from the beginning, the company
has to express it directly if the customer's request is too demanding to implement and
if it takes a lot of time and money.

"...we aim to be realistic and honest about what we can stretch as a startup so
if we get huge requests... the requests can be very demanding to implement so
then we aim to express it as soon as possible and just honestly say that it is
manageable but it takes this much time and this much money.” H4

If potential defects occur, they should be adjusted with the highest priority and allow
the uninterrupted use of the service. It is also important to indicate the fault with the
help of the diagnostic tool, especially to prove that it was not the company’s fault. In
the heart of business, building trust and credibility in providing a service to a larger
client, helps to get semi-public reference clients. Through these clients, the startup
can gain new partnerships. In addition, the security of technical and administrative
safety can be assured by showcasing and demonstrating the technical architecture of
how the service is built and that the service is information secure.
"Technical and administrative safety reassure that our technology is strong enough that no one can hack it compared to if this was some dodgy business that we would run from our garage. By showcasing the technical architecture that this is how it is built and proving that it is information secure." H2

6.4 Impact on the revenue streams

6.4.1 Obtaining turnover and funding

As of now, co-creation is yet to bring in turnover for the startup companies. This is due to the fact that many projects of co-creation are still in the piloting stages.

"These projects are all still in the piloting phase so they haven’t brought in any turnover as of now." H1

From the viewpoint of income and cash flow, co-creation is quite negative because hospitals can easily stretch the time of payment which works against the startups. The benefit for the both parties would be for the hospital to commit itself to the project of co-creation also economically, which would be an indication of genuine interest for the investor.

"From the viewpoint of finances, of course it would be even better if the co-creation partner would be committed to this also financially so that it indicates to the investor that it is genuinely interested..." H3

The sales processes in healthcare and the implementation of the solution are often very long processes. From a startup’s point of view, it would be very important to acquire cash flow earlier than in the current situation. Due to co-creation, cash flow is not fast and companies need to be prepared for long sales processes where they have to meet a lot of customers and convince individuals on multiple layers.

"...I would have wished that we had acquired cash flow a little earlier... I feel that co-creation has impacted the fact that we haven’t acquired cash flow that fast." H3

A small company needs to get turnover, so the firm cannot spend too much time on planning. Proceeding by doing requires communication and frequent meetings so that the project is able to progress.
“... these sales processes in the healthcare context and the implementation of a solution are quite long compared to many other industries. There are a lot of information security issues that one has to take into account... it begins when we are getting involved into a test project, piloting project that lasts for some time and then we analyse the results and then commercialise it. We are a small firm so we need to start making turnover quite early so we have taken note of the proceeding by doing that we haven’t wasted time on planning... Proceeding by doing and really just starting to do requires communication, frequent meetings so that it progresses...” H4

A common question startups are pondering about is that how could they acquire money from auditing, consulting and guiding because it is also an investment into the future.

“...how would we get money when we are auditing many businesses internal processes, consulting and guiding how they should act... this is not sensible business but it is an investment for the future.” H1

As of now, co-creation can work as a leverage in financial negotiations but it is not likely to provide any direct monetary assets. Nevertheless, getting a funding from Tekes is easier and the benefits have mostly been reflected in the funding application phase. Co-creation brings in investors much easier. Also active participation and involvement in various events is beneficial.

“...being actively participating in every occasion even though we are together with Tekes so... We are in almost every single one of their events so of course being this active and participation has helped us in gaining that funding.” H4

“Maybe the whole package combined has been a prerequisite for funding. ...the chance that I would have gotten the idea myself and developed the product in a vacuum I would have been in a worst possible position from the viewpoint of funding.” H3

6.4.2 Success indicators

The success of operations and income is measured by the use of various indicators, as well as commercial and product development basis. Key Performance Indicators (KPIs) are used to measure the use of the service per minute, per customer and the number of users. Commercial starting points is to commit the co-creation partner into a customer or the acquisition of other customers based on which the decisions were
made. Success is determined by the sales capability and sales success of the solution. The starting point for product development are the selection of a few viable hospitals, the process evaluation and lastly the most important is the time. Success is measured by the usefulness of the product to the customer and the product's further development ideas. A financial compensation should be paid for the completed work.

6.5 Impact on the key resources and cost structures

6.5.1 Increase in resources

The increase in resources refers to the increased know-how regarding the healthcare sector, the increase of physical, economic and human resources, and the impact of co-creation on the activities of healthcare professionals and their use of resources.

As the know-how of the healthcare sector increases, co-creation brings in with the help of consulting, employee resources, experiences and know-how about the industry. This is significant because startups do not have any clinical healthcare professionals on their payroll.

"In practice we can also think about human power as a resource because we have had the opportunity to consult clinics, nurses and other healthcare professionals so through that we have gained experience and it has benefitted our company internally." H1

"...it has increased our know-how and human resources because we don’t have any healthcare professionals on our payroll... it has helped us to gain capital...” H2

Different workshops, demo sessions, trainings and lectures increase know-how and the potential of co-creation.

"All workshops, all demo sessions, all trainings, all lectures that we have visited have increased our know-how and exactly the potential of co-creation...” H4

The understanding of the markets and the problems faced by customers can increase with co-creation. However, there can be cases when the company can feel that
knowledge is acquired only with the help of money. Sometimes a company feels that it is taking responsibility only by itself. Furthermore, it is important to know from the very beginning that co-creation works, in order to receive more investments, hire more employees, and better serve the customers.

"Of course our understanding about markets, problems of customers has increased but I don't know, in my opinion, know-how is acquired only via money at the end of the day." H3

"It hasn’t increased them significantly (physical, economical or human resources). ... I think those are gained with money." H3

The impact of co-creation on the healthcare professional’s activities is a relatively unknown topic for the startup companies. However, it can be said that co-creation increases the efficiency of the personnel and reduces paperwork.

"... before the patient has received everything via mail... all invitation letter to the operation and other so now they don’t need to do that for example. So it does reduce this kind of paperwork. But I don’t know if it has reduced phone calls etc...”H4

6.5.2 Occurrence of costs

Human resource costs as the largest expenses for a startup. In addition, infrastructure maintenance, travel and office costs, technology costs, equipment costs, servers and product development costs are worth mentioning.

The interviewees' thoughts on the effects of co-creation on costs varied considerably. One interviewee thought that co-creation has not had a cost-cutting effect because they had not found any new ways to work more effectively.

"It hasn’t really had any cost-cutting effects. I mean that we would have found a new way to implement it more efficiently. There hasn't been one." H1

On the other hand, co-creation can actually increase the costs because the companies had given free access to the services and purchased certain equipment.
"On the other hand it has increased our costs because we have given our service for free and purchased some equipment but pretty moderately I must admit." H1

The companies had saved resources because they gained the expertise of clinical experts through co-creation and on the other hand, the cost effect was reflected in getting things done right and at once.

"...we don’t have those clinical experts so if we wanted to do this kind of co-creation, then we would have to acquire that clinical know-how from somewhere or receive feedback and that could cost us. So in that sense it might have saved our resources... we need to acquire that clinical know-how from somewhere and that we hasn’t acquired yet so in that way it has helped us.” H2

"Maybe the impact can be seen in a sense that we have managed to get things right at once... We have done it well…” H3

In the end, it was stated that co-creation has not created a negative rise in costs, but it has not lowered them either.

"Co-creation requires resources especially when we talk about other countries than Finland, soo ne really needs to visit the place physically and often. I wouldn’t say that it has lowered our costs. But I can’t say that it has risen them negatively either…” H4

6.6  Impact on the key partnerships

6.6.1  Gaining partnerships

Co-creation can help the startup to gain partners, as those partners are the most important and they acquire a deep relationship. On the other hand, it can be possible that co-creation is still in its early stages that it has not affected on other companies’ interest in the startup’s solution. The reputation of the current partner with whom the startup company cooperates affects a lot more. It is possible to gain a huge number of contacts from a startup accelerator. However, co-creation is valued and a correct way to approach the healthcare market.
"I see that these co-creation partners are our most important partners. So in that way yes. We have a good and deep relationship with them..." H3

"Co-creation has been valued, that it is the right way to approach the healthcare context. I do believe that it has been helpful." H4

The chosen startups has several stakeholders from the startup accelerator but they are not mentioned in the study in order not to accidentally miss an important partner. From the level of customer organisation, the partners are nurses and doctors, procurement personnel, information management and generally other business customers. In addition, public and private funders as well as Tekes, system providers, players in the digital health ecosystem and other partners also from overseas. The regulatory side identifies security requirements in Finland as well as in the USA. In addition to these, technology partners are mentioned. Their technology has been utilised in their own services and equipment manufacturers both domestically and abroad. They have a desire to help startups to succeed, as they know that if the startups are successful, then their devices will be sold.

"Yes, for example, with these equipment providers... they clearly want to help us to succeed because they know that if we succeed, then others will also succeed. They want to help us and make their bit because they know that we have an existing clientele. If we succeed, then they will also be able to sell their machinery..." H2

6.6.2 Access to the markets

Customers from outside Finland are usually directed to the company through various partners such as the technology partners. It is also possible to get leads through various trade fairs and events that gather different people and businesses. The events of Tekes are aimed at exporting Finnish healthcare technology abroad and larger hospital projects may sometimes launch projects abroad, which may prove useful for startup companies.

Through co-creation, the better access to the target market have been reached, which gives the company a better position compared to its rivals and increases its commercial success. The company's operations and access to markets can slow down because of the time spent in creating a customised solution for each hospital, but
through individual guidance, the company stands out from its competitors, which is a useful option in the long-term. With co-creation, understanding of the markets, such as the hospital environment and customer problems has increased, helping the company in creating customised solutions.

"We have good preforms for different needs and co-creation could be a good way to get into these customers and acquire also commercial success." H2

"To understand... maybe that is the most concrete thing in my opinion, so that we understand the markets..." H3

6.7 Impact on the key activities

6.7.1 Better access to the hospital environment

Co-creation helps startups to get into the hospital environment and to understand the environment where the services are used in.

"Yes. We understand the context where we are designing a service even better than before." H1

It also helps to make it easier to reach out to the special healthcare unit as well as in understanding the healthcare environment when the startup can observe the daily routines of nurses and other personnel.

"... yes co-creation has helped to understand the context of healthcare much better. And, that we have observed physically how nurses work, what kind of patients come in, what are the parents like or how do they perceive the upcoming operation etc.?" H4

Co-creation is important, especially in the healthcare and hospital world. The interviewees pointed out that nursing personnel should understand the benefits of the solution, which requires close customer relationships and co-creation. The staff should understand that the new service is not just a burden but a workload removed from other work and thus, brings value to the hospital. Before the startup phase, all healthcare personnel must familiarize themselves with the user interface and communicate its value clearly.
Entering into the hospital context helps startups in selling their solution, boosting credibility, engaging customers and enabling customer-targeted service deliveries, and to help reach the target market.

6.7.2 Co-creation at an early stage

Without a doubt, co-creation is still in its very early stages and its share of all development was still very small. Thus, the impact of co-creation on revenue streams, for example, will be seen later on.

"... For sure it has an impact but it will be seen later on. Then we can evaluate what kind of economical and commercial impact it had...” H2

Furthermore, co-creation would only be utilized when the results were more concrete.

"But most likely we will... we would utilise it when... the fruits of co-creation were more concrete... we would’ve implemented some service more widely for the benefit of the partners in co-creation, for example, university hospital or something else..." H2

Good feedback and the involvement from the start encourages startups to continue the co-creation even further.

"we have received good feedback and we have been involved from the beginning so of course it has encouraged us to continue our work.” H4

There is not much information about the impact of co-creation on the use of healthcare resources because it is still in the testing phase. At the time of the interview, it could be said that it was thought to reduce the workload of healthcare professionals.

6.7.3 Other experiences of co-creation

Co-creation is, according to the interviewees, a very significant issue, even referred to as a lifeline. At the very least, co-creation increases the end-user value regarding
the service usability and enables communication at an early stage, as co-creation is largely collaboration. It also brings in credibility for the startup company.

"... it has enabled the fact that we could communicate in a very early on in the process. We are doing this together. We have gained credibility to our own story..." H3

Co-creation can strengthen the decisions that already existed in one’s own strategy regarding the company’s services, and it will influence their choice and timing of their clientele. It especially reinforces the strategy of integrating the company's service into the patient information systems of the larger player. Co-creation also helps companies to complete exactly what the hospital wants them to complete.

"In a way co-creation has helped a lot in making us complete the right things... the things that are needed by the hospital personnel without forgetting the parents and the children." H4

With the help of co-creation, the company can assess itself how willing are different organizations to take on new services and change existing processes so that new solutions can be utilised in those environments.

Co-creation can have more impact on the operational than on the strategic level. The competitive environment was found to affect the company's choices to such an extent that the company had to do its best to distinguish itself from its competitors.

"Maybe it does have an effect on our choices on some level, what kind of choices we have to make if we know that our competitors are doing something different, so of course it has an effect on us because we might not start doing the same thing but maybe try to do it in another way or in a completely new way." H4

Co-creation contributes to the utilisation of data by having the company to receive a lot of materials from customers and partners that they can use in their own operations. They can also receive relevant information about their customers' business when they need it.
Co-creation can have differing effects in regards to technology integration. On the other hand, co-creation is believed to have supported technology integration into the existing systems, and precisely this very easy integration would make it possible to spread the service to a larger number of customers. It also helps to approach IT and provides information on the interfaces of patient information systems and helps to integrate into these systems. However, according to one participant, co-creation has not supported technological integration at all so far. On an employee level, technological fears were reduced through co-creation.

As a whole, co-creation is a good and prestigious project that is of great help. It is also the right way to approach the healthcare sector in particular, and co-creation teaches the company a lot about the progress of the co-creation process and makes it possible to move from an idea into a product. The challenge is that, through the service provided by the company, the customer changes their own business model or explores a new business area, and at the same time the company becomes involved in the change management process of the customer organization.

Co-creation is suitable for the healthcare sector startups, as the industry consists of very large and expensive projects in mature markets such as healthcare. Without co-creation, the startup company’s work would not be successful, as co-creation was found to be the only way to enter the hospital environment.

"Because we don’t have the expertise from the healthcare sector, the communication with the customer is so important. In practice, without co-creation none of this was possible...” H4

Co-creation is considered important, especially in the healthcare and hospital worlds, because they require very close customer relationships so that nurses understand the benefits of the solution that they would not see new services as a burden but rather as possible value for the hospital.

"Specifically co-creation not just creation... According to customer’s needs or just according to our needs but together. It serves both parties... It is a fruitful mode of operation.” H2
6.7.4 Development proposals for co-creation

In co-creation, it would be important to agree on clear objectives and expectations with both partners before taking on the project. They are still in an early stage in identifying and coordinating the aims of the stakeholders. The criteria for the piloting phase should be clear so that companies can assess their success. It is worth to notice that co-creation cannot be done all the time, so the parties must agree on the objectives of the actions very carefully. One of the problems encountered by companies had been that at the beginning there was no immediate agreement on what the parties would expect from the project, and in particular, with what kind of timetable.

"...it might be a lifeline to us... but maybe I would’ve hoped that we found a better standardized contract that includes the expectations and the timetable.”

H3

Another challenge for startup companies are situations where customer organizations did not necessarily tell directly where the current change has started, what it is trying to do and whether they have the skills and training to implement the solution. In many situations, communication does not necessarily flow smoothly, but involves misunderstandings, many people say different things, which is difficult for the business. The solution provider itself has difficulties in estimating whether the hospital personnel is sufficiently skilled or if the management is committed enough to change or what change has originally been launched. Finally, it is said that end-user’s participation right from the beginning is beneficial.

Co-creation was found to require a lot of discussion, but at some point startups should get some problem to resolve. The interviewees hoped for more time together and expressed the desire to start co-creation from small problems, which could take it forward.

"... We are still learning... moreover we should be able to find more time together... we should start from smaller pieces and not necessarily try to fix the problems of the whole world at once but through smaller pieces and gain small victories that way...”

H1
Generally, the interviewees hoped for more co-creation activities in the future as it is useful for startups, although much more practice is needed.
7 DISCUSSION AND CONCLUSION

The research objective of the case study is to examine the form of co-creation and business models within the chosen two digital health startups and how co-creation progresses in them. The main research question is to examine how co-creation affects the startup’s business model. The theoretical impact of co-creation on startup’s business model is studied through the features of co-creation and through the elements of the Business Model Canvas. The digital healthcare context is the background for this study. The research data is collected with the help of theme interviews (n = 4) and the material is analysed with content analysis.

The aim is to provide information about the central criteria of co-creation with which we can evaluate the impact of co-creation on the digital health startup’s business model. According to the research task, in conclusion the focus is on co-creation and its impact on digital health startup’s business model through the central criteria of co-creation. The findings suggest that co-creation is an important topic for the startup in the healthcare context. The biggest significance of co-creation was that through this process it is possible for the startup to get into the hospital environment.

The research question 1.2 is to explore the main features of a digital health startup’s business model. Only digital healthcare companies are interviewed. The main features of the digital health startup’s business model emerge in all of the criteria in the findings section. Both companies have digital and marketable ideas for healthcare. It is not enough, but they need to be built into a product or service that solves customer’s problems on a timely manner. This requires not only the personnel of the company, but also personnel from the healthcare sector. The product or service must be successfully exported to the market in order to cover the costs. Getting financial support may be uncertain. The company needs right partners and collaboration in order to develop. Communication can be done remotely and virtually. Operating in the healthcare sector requires the company to build confidence at different levels.
7.1 Discussion

Co-creation influenced the procurement of a product according to customer’s needs and furthermore, into the value proposition of the company. With the help of co-creation, it is possible to create a solution that solves customers' problems and fulfils their objectives and expectations. The basis consisted of onboarding and engaging the healthcare professionals in order to get them involved in the activities. There must be someone involved who knows the context of the treatment processes. Value creation should take place where the solution is used, for example, hospital or home. It is important to work in an environment where you can test medical devices in a genuine environment. Proceeding by doing is an essential aspect of co-creation. Changes to the business model derive from the value proposition because it is under discussion of what kind of product and service combinations could be development within the healthcare context. Main discussions revolve around the decision whether the company should sell its services as generic versions or customised to each customer and end-user. This can differentiate the company from its competitors.

According to Lepistö and Aaltonen (2016), the implementation of a partnership approach in the case of professional services requires at least partial customization of the service, which means that the communication and cooperation between the service provider and the customer can be high in volume and customised regarding the needs of the customer. Challenges in the commercialisation of specialist services include, for example, the different interests of actors, the identification of customers' needs, the communication regarding the content of the service and company’s own expertise and the difficulty of defining which part of the service should be tailored to the needs of the customer and what part should be standardised. The purpose of the specialist services is to find a solution to the customer's challenge in cooperation with the customer. That is why it is important to pay attention to the methods of co-creation.

The management of customer relations through co-creation in the hospital context, and proceeding by doing, require close contact and frequent communication. It was natural for the interviewees to communicate remotely through virtual channels which was found to be the company's lifeline. However, the first meetings were preferred
physically face-to-face rather than virtually. The frequency of communication was
dependent on whether one was a customer, a hardware or service provider, partner,
investor, other company. Relationships with customers were considered natural and
the connection was maintained at different frequencies at different stages of co-
creation. Businesses lacked expertise in healthcare which increased the
communication between the startup and the hospital.

According to Ramaswamy and Gouillat (2010), end-users are no longer passive
recipients in business but actively involved. Because of this, the boundaries of
production and consumption are blurred. According to the findings of the study, co-
creation had implications on the element of customer relationships in the Business
Model Canvas. Co-creation had activated clients (hospital personnel) and end-users
(patient or patient's parents). Customers wanted to participate by sharing their
problem and expressing their wishes and participating in activities. End-users were
actively involved mainly in answering the feedback.

For the element of customer relationships, co-creation brought an aspect of equal
participation. The startups had experienced that the partners had treated them
equally, but on the other hand it was stated that each party had their own agenda.
According to Grönroos (2015), service providers and customers do not necessarily
acquire the same goal from co-creation activities or benefit equally from the process.
It is hard to find a situation that both participants are on the same page.

Although the healthcare services were found to require Business-to-Business, as in,
sales, co-creation had impact on the distribution channels- element of the Business
Model Canvas i.e. how the value proposition is delivered to the customer. One option
was to integrate with the patient information system provider which would make
them responsible of the distribution. On the other hand, the automation of sales and
distribution over the internet was considered. From the point of sales, co-creation
was a channel that sought out potential customers by taking company’s employees to
sales meetings and actively participating in various events. Through the piloting
projects ran by university hospitals, the company had better chances of getting
abroad.
The customer's awareness regarding companies after reputation and status also increased. Increased reputation was found to have contributed positively compared to the competitors. Especially if there were big players involved. In addition, taking good care of communication also improved the company's reputation. In the improvement of the status, companies were found to be at least at the same level with competitors and it was assumed that there was little improvement in a way that the company gained better access to the target market through co-creation. By creating a product according to customer’s needs also increased the company’s status.

The companies gained awareness after their credibility increased. A collaboration partner was found to increase their credibility, and one of the most important benefits of co-creation was that it had helped startups in entering the hospital environment and through that the co-creation partner helped build the company's credibility. Operating in the healthcare sector as a startup demands credibility building at different levels. Credibility was also boosted by obtaining semi-public reference clients, communication in the early stages, co-creation, honesty and realism, as well as technical and administrative information security. According to Ramaswamy and Gouillat (2010), there is also a possibility to increase brand awareness and build trust within the society one operates in.

The impact of co-creation on the revenue streams of the Business Model Canvas of the company was negative. Co-creation had not yet brought any turnover for the companies involved and the sales processes were long. It was hoped that the hospital would commit to the process of co-creation also economically and would be willing to pay the company earlier. Customers were also not prepared to pay for the audits, consultations and guidance provided by the company. The operations and revenue streams were measured with the help of various indicators as well as from the commercial and product development viewpoints. The importance of time in product development was raised, which means that the company should be able to move forward as quickly as possible. Secondly, the company should receive a financial compensation.

The results of the impact of co-creation on finances were contradictory. On the other hand, it was noted that co-creation may have contributed to the finances indirectly.
On the other hand, it was stated that no money has come out from this process. In financial discussions, co-creation had been used as a leverage and receiving funding from Tekes was found to be easier.

In order to execute, maintain and deliver the promised value proposition in the context of healthcare, the startup needs clinical expertise. When evaluating the impact of co-creation on the element of key resources of the Business Model Canvas, the biggest impact is related to people, knowledge and experience brought by healthcare professionals. Co-creation brought some changes to the resources of healthcare professionals. These were at least a decrease in paperwork and the option to work remotely. Overall, the co-creation literature recognizes the importance of consumers’ creativity, knowledge, and technological capabilities and claims that firms should consider exploring situations where users take part in the processes of designing, developing, and producing goods because they are willing to do so in ways that are beneficial for both producers and consumers (Lang et al., 2015, Ramaswamy & Ozcan 2014). Prahalad & Krishnan (2008) state, that it is not necessary to own all the resources but it is enough to have access to sufficient resources and the knowhow of how to utilize them properly.

The most significant costs for companies occurred from personnel costs. In addition, infrastructure maintenance, travel and office costs, technology costs, purchase of equipment, servers and product development costs as well as co-creation was also mentioned. Co-creation did not have negative effects on the cost structure of the business model. Participants had failed to find more efficient ways of working. The startups’ had given their service for free and acquired medical equipment but they had gained in getting clinical experts involved. This way the service or the product is correct the first time. The collaborative innovation with consumers has the possibility to become a cost-efficient or even costless way of innovating but only if it is managed properly (Seppä &Taney 2011).

Co-creation had an impact on the element of key partners of the Business Model Canvas by helping the company to gain partners that assisted the startup in entering new markets. Of course, some of the partnerships mentioned by the interviewees had cooperated even before co-creation. The most concrete change was considered to be
the increase in market understanding in the context of healthcare and in customer problems, which in turn helped to create customised solutions.

The companies had quite a few stakeholders and other partners. With some of them they had already built a relationship even before co-creation. Few of the partners had been gained through co-creation. The co-creation partners were the most important partnerships the startups had and with them the relationships were substantial. Therefore, co-creation has an impact on the key partners element in the Business Model Canvas.

The company’s execution of value proposition, the usability of the distribution channels and the fulfilment of customer relationships required companies to enter the hospital context. Thus, co-creation has had an impact on the core business processes of the company’s business model. Co-creation also helped them to enter the hospital context and to understand the environment where the services come from. Access to the hospital environment, in turn, helped the company in sales of the solution, in increasing credibility, made customers more committed, enabled customer-targeted service deliveries, and helped to reach the target market.

The interviewees stated that co-creation was still in the early stages. Many effects will only be seen later. Good feedback and involvement from the start encouraged the companies to continue the process of co-creation in the future. Co-creation was found to be a very important issue for a startup in the healthcare sector. According to previous studies (e.g. Koehler 2015), business-oriented business models often fail to meet the changing needs of customers. Prahalad and Krishnan (2008) state that the product and business-oriented view of value will be replaced by personal experiences and co-creative view of value. Ramaswamy and Gouillat (2010) describe co-creation as the democratization and decentralization of value which means that companies start to focus less on the interaction that happens purely inside the firm.

Co-creation had strengthened the core functions that were necessary in regards to the business model. It had strengthened its own decisions in their existing strategy regarding services, influenced customer selection and timing, and strengthened its strategy of integrating the company's service into the patient information system of
some bigger players. For the sake of customer retention, it was important that co-creation had helped companies to do exactly what the hospital needed them to do. Through co-creation, the company had received data that could be utilized in its own operations. The results were scattered when asked about the impact of co-creation on the technology integration. The challenge of co-creation was to involve the company into the process of transforming the customer organization through change management.

Earlier literature (Seppälä et al. 2016) shows that co-creation is a manageable process. By controlling certain features, it is possible to reach a specific goal. These features include goals and commitment, role definition, shared resource base, utilization of expertise, concentration on one customer relationship at a time, common platform, leadership skills, time, trust, design and realistic assessment. If the production of a product and a service in a healthcare context is part of the core business of a company, and access to the hospital context is only possible through co-creation, it is worth taking the suggestions of the interviewees into account regarding the development of the co-creation process. Right from the beginning, the parties should agree clear goals and expectations as well as a timeframe. The piloting phase of the project should be clear. Businesses should know if the customer organization has expertise and training related to implementation of the solution. Communication should be flexible in order to avoid misunderstandings. The management should be committed to change. It would be useful to get end-users involved right from the start. The interviewees also noted that although co-creation requires a lot of discussion, at some point, the startup company should be able to start solving a real problem. The process of co-creation could begin with small problems. The interviewees hoped for more time together for co-creation and in the future for more co-creation.

7.2 Reliability, validity and limitation of the research

Robson (1995) separates the original research strategies into three categories of which one of them in case study. The purpose of a case study is to mainly map out a phenomenon. In many cases the research method is qualitative but it is not a given. (Hirsjärvi ym. 2002.) Yin (2003) criticises the fact that with a case study one can
only produce a small amount of scientifically generalizable information. The results of a case study can be generalized but it will be done according to other theories but not to other populations. According to Metsämuuronen (2000) case study can increase the level of understanding of a topic therefore the goal is not to scientifically generalise findings. In this particular case study, the approach is qualitative and the aim is not to generalise the results but to increase the quality of literature so that the researcher manages to reach the phenomenon at hand (Niemin 1997). Heikkilä (2004) points out that research is reliable always in the present time and place and the findings should not be generalised to another time or another society (Vilkka 2005).

Every study aims to evaluate the reliability of the completed research. The assessment is done through two concepts: reliability which refers to stable and consistent results and validity which is an indication of how sound the research is (Hirsjärvi ym. 2002). Here the focus is particularly on the validity of the study. The definitions of the key concepts of the research are co-creation, business model and digital health startup. These were also chosen for the theoretical framework. These definitions play a central role also in the research questions and based on these concepts the base for the theme interviews was formed. Questions according to the aim of the research were asked in the analysis of the content. The researcher could have focused on finding studies from the health care industry already in the beginning of the chapter co-creation. Eskola and Suoranta (2000) state that the reliability of the research is based on the notion that the conceptualisation of the researcher and the final findings complement each other (Vilkk 2005). The factor increasing the reliability of the study was the fact that the topic itself was suitable for a marketing student excluding the fact that the topic of co-creation was not very familiar for the researcher from the studies.

The execution and the reliability of the study cannot be considered as two separate events because the research was conducted as a qualitative study. One of the criteria for reliability is the researcher itself and one’s honesty; the actions, choices and solutions of the researcher. The evaluation of reliability is executed constantly in relation to the theory, method of analysis, grouping of research material, categorisation, investigation, interpretation and drawing conclusions (Vilkk 2005.) The researcher had no prior experience regarding interviewing or designing theme
interview structures. There is a possibility that the researcher failed to ask enough ‘why’ questions after interviewee expressed their initial answer but in some instances continuing questions would have been beneficial. According to Mäkinen (2006) the interview should be tested with sceptic and critical interviewees. Testing of the theme interview structure was conducted initially with one person. The aim of this was to test the easiness of the questions and to understand how long the interview takes. The theme interview was quite long. The interviewees answered more thoroughly to questions in the beginning of the interview than in the end. The researcher could have scheduled a longer time for the interviews. On the other hand, in this case saturation might have been experienced because eventually the interviews start to become more repetitive and there is lack of new input (Eskola & Vastamäki 2015).

Mäkinen (2006) states that the researcher must explain the concept of anonymity to the interviewees in order for them to stay anonymous. Every interviewee was asked if it is okay to mention the name of the company in the research. All participants agreed. The businesses utilised for the benefit of the study are startups. These startups were part of the Wille project and it has more information online (also the names of the companies involved). The names of the participants stay anonymous throughout the study and they have been coded with numbers from 1-4. The small sample can be threat to the participant’s anonymity. This might have had an effect on the content of the answers.

According to Tuomi and Sarajärvi (2002) evaluating reliability one must also consider impartiality (Vilkka 2005). The topic for this research was given externally and it is part of a bigger venture that the researcher had no work or other relationship with. The startup businesses involved were not familiar to the researcher prior the study. The interviewees were suggested by the same person who runs the project and the research permissions were acquired by the WILLE project. The number of startup businesses involved is two and the interviewees is four participants altogether. The number of participants were seen appropriate in order to ensure that the study gained enough data. Eskola and Vastamäki (2015) states that it is not possible to give an exact number on a study consisting of theme interiews but it has to be scheduled with the instructor. The amount varies between the topic and the extent of the study as
well as the researcher’s university recommendations and the chosen method of analysis. (Valli & Aaltola 2015.)

Hirsijärvi et al. (2002) adds that the precise narration of the qualitative study increases the level of trust of the research and this concerns every part of the study. The process of categorisation is important in gathering data in qualitative analysis and therefore, the researcher must elaborate about the roots of the categorisation and the basis for it. In addition, the researcher must justify the statements made. This particular research has been enriched by several direct quotes deriving from the participants. The process of content analysis has been described in further detail in its own chapter and the interview process has been described in the chapter of data collection. According to Patton (1990), Weber (1990) and Burnard (1996) the challenge of content analysis is how the researcher manages to simplify the content so that it represents reality as much as possible. It is vital that the researcher can reliably showcase the connection between the material and the results. (Latvala E. & Vanhanen Nuutinen L. 2003.) Interviewees’ original expressions were used for purposes of trust of the research. The limitation is that the interviewees used local dialects, and the rich nuances of the expressions they used were lost when they were translated to English. This research utilised data-driven content analysis of which starting point was the original interviews. In order to increase the reliability in content analysis, it was completed by one person only. The results of the content analysis were given to the contact person of the WILLE project and who is familiar with the research phenomenon.

Mäkinen (2006) states that the basis for research material is always the reliability of the study. The researcher must comply with the promises give to the interviewees regarding the use of the material. In this research, the participants were asked a permission to record the interviews and the permission to show them to the contact person of the WILLE project. After the final research has been completed, the tapes will be disposed.
7.3 Suggestions for future research

The impact of co-creation on a digital health startup’s business model can be evaluated with certain criteria. For example, how the company has succeeded in delivering a customer-oriented service solution. A questionnaire could be used to test how reliable these criteria are and how they could be transferred to different companies in other industries. In this study, only healthcare companies were examined. Quantitative research would help to evaluate the special features, criteria and a tool to evaluate the co-creation of companies.

7.4 Conclusion

Co-creation is of great importance to the healthcare startup, so one should pay attention to the characteristics of co-creation and agree on certain aspects with the parties in advance. It is also worthwhile to think about what kind of people are employed for the job. Does the company also need employees that have qualifications from the healthcare industry? The process of co-creation demands the identification of the needs of the customers and the solution should be found together. For this reason, different parties should acquire know-how about the various methods of co-creation. Through the customer (e.g. hospital personnel), the company can receive information about end-users' experiences and feedback, which helps to implement the service or product. The attitude should be such that all parties understood that the benefits of co-creation are for both parties equally.

The change of attitude also derives from the notion that one does not need to own all the resources in co-creation. There must be sufficient resources and knowledge how to properly utilise the available resources. The business-centric business model can no longer meet the changing needs of customers. In co-creation, value creation is decentralized and companies focus more on interactions outside the company itself.

The major importance of co-creation is that it enables the startup to better access the hospital context and help to understand the environment where services will be implemented. Getting into the hospital environment enabled the company to produce a product according to customers needs, helping to reach the target market and to
deliver the solution, boosted credibility and made customers more engaged. According to the results, co-creation had a positive impact on the elements of BMC. Only the impact on BMC's revenue streams is clearly negative. The results indicate the key criteria for assessing the impact of co-creation on the digital health startup’s business model. Within the criteria, the special features of the digital startup company are being developed.

The research is part of the Wireless lab environment for business project (Wille-project). The outcome of the project is to provide an operating model that enables digital service development and integrate services into treatment processes. Research contributes to the achievement of the Wille project's goals. It increases awareness of the co-creation in the context of healthcare for various parties. By evaluating the criteria and the emerging special features of the research, it is possible to find out more about co-creation in the health care context. The results can be used to improve the performance of co-creation. Results can also be utilized when evaluating the impact of co-creation on the business model of the digital health startup.

The results of this case study can be utilized, especially by a startup company in the field that develops a product or service into a hospital context, but is uncertain about the effects of co-creation and its benefits and disadvantages. These results can shape the willingness of a digital health startup company to make progress in the industry and provide indications of how the process is going to develop. Outcomes may also be necessary for hospitals to see how co-creation affects smaller digital healthcare startups, and how important this co-creation can be for both sides.
REFERENCES


**Internet sources:**


APPENDICES

Appendix 1. Theme interview questions

Theme 1. Background questions

1. Please tell me about the background of your company.

2. Please tell me about your key partners.

3. Please tell me about your solution (product/service).

4. Please tell me how you maintain customer relationships;
   a. Listening to the needs and wishes of customers
   b. Building trust
   c. Active participation of customers

5. Please tell me about your distribution channels and how to conduct sales.

6. Please tell me the stakeholders of your startup (other than customers); communication and participation
   a. The company’s stakeholders
   b. How to communicate (how, where)?
   c. How frequently throughout the process?
   d. Equal participation

7. What is meant for you by co-creation?

8. What kind of experiences you have from co-creation?
   a. Interactions as a base for value creation
   b. Recognition of other stakeholder’s aims
c. Responsibility and roles

d. Proceeding by doing

e. What kind of activities; workshops etc.

f. Did the procedures have any impact?

g. What impact has the above-mentioned brought on the startup’s business model?

Theme 2. The impact of co-creation on a business model elements. (The Business Model Canvas and its 9 elements)

1. Value propositions

The value for the end-user / has already been discussed in the background questions.

How does co-creation impact on the value created for the end-user?

Has co-creation increased your reputation rankings compared to your competitors?

Has co-creation helped you to gain a better position within the value network compared to your competitors?

Has co-creation impacted the value perceived by the end-user, has it made them more active in the context of healthcare?

2. Customer segments

(Regarding key customers and whom the company creates value has been discussed in the background questions)

3. Channels

(Regarding distribution channels and how sales are conducted, it has been discussed in the background questions)

Has co-creation helped to get into the hospital environment/ helped in selling the service solution?
4. Revenue streams

Has co-creation helped you to obtain more money or funding and has it impacted your revenue model?

Has co-creation helped you to receive governmental funding (e.g. Tekes) or others?

Has co-creation helped in gaining a better position in the point of sales and have you captured funding that way?

5. Customer relationship

Customer relationship management has been covered in the background questions.

Has co-creation helped the company to get access to the target market and helped it understand it better?

6. Key resources

What kind of joined resource base does the startup acquire after co-creation?

Has co-creation helped the startup to increase the following;

- core competencies
- know-how, knowledge, experiences
- physical resources (technology, rent, equipment etc.
- economical resources (money)
- human resources (people)

7. Key activities (tell me about your key activities)

With what criteria does the startup utilise to evaluate its own activities and processes?

Has co-creation helped you to make better strategic decisions and choices? (… in relation to earning the value proposition, maintaining the functionality of the distribution channel, success of customer relationships and the implementation of revenue streams)

Has co-creation had a positive impact on the management of information or utilisation of data as part of the healthcare context?
Has co-creation supported the technology integration in the existing systems?

8. Key partners (tell me about your key partners)

(The key partners and stakeholders have been covered in the background questions)

Has co-creation helped you to gain better partners or stakeholders?

Has co-creation had positive impact on the healthcare professionals’ activities and the usage of resources.

9. Cost structure

Please describe how your costs occur. Has co-creation had an impact on the costs?

10. What else would you like to say in relation to the impact of co-creation on your company’s business model.
Appendix 2. Example of content analysis

| 3. Kanavat |  |
|---|---|---|
| Sairaanlakokonttiin sisäille pääsy ja rajoitsien myynti | Petkisterity listaus | Aikakategoriä | Viikokategoriä |
| | Luultavasti auttau myy missä. H1 | | | Vaikutukset kanavien. |
| | Niin, se että me ollaan muu keskus paikoin sisällä ja siellä yleiseen naapurin asiainmaurioiden kanneja yli hienoin tehdä palvelua, niin se nostaa sen asiak Askun star asikkaan näkövasta neuvola mieleen urkaustavan tyylin omalle levylle. H2 | Testilaboratoriossa mukana olen yleiseen naapurin asiainmaurioiden kannessa auttau urkaustavan. H2 | Uurkaustavan tyylin. H2 | Vaikutukset kanavien. |
| | Toisalta me ollaan yhteiskunnallisesti, niin meillä on varamme kaikki, mitä asiakkaita kaipaavat... jos tärvite, tämä on auttau, mitä he alun perin ovat läsnä. Rakennuksen yhteiskunnallisuutta on siten ja se laitaa siitä ratkaisun. Niin mutta se hankala kuvitella, että siten tuli, joka toinen firma vastaan esikars. H4 | On hankala kuvitella, että joku toinen firma tuli sillä, jos tuote ja ongelma jota yhteiskunnallisesti ratkotaan on siten ja siihen liittää rakaisu. H4 | | Vaikutukset kanavien. |

| Me ollaan osallistuttu tämänmoinen sanavien pahoittamin tapaamisen ja ne on järjestyneen vaikka tämänmoinen voina osaidea tahoja ja, mitä vaan mahdollisuus ja lapselle lastenepenkiin tuoda, H4 | Osaamisminen sanavien ja ideaalintuomarin. H4 | Myrinnis auttau. H4 | Vaikutukset kanavien. |
| Ollaan aktiivisesti ollut mahana aina aste. H4 | | | | |
| Oulu seiklan... ympäristö, missä voi taitata aiheita ympäristöä... niihin lähtölänitä laitteita, niin se on ollut hitaasti tärkeitä, että me ollaan olut siitäkin mahdun. H4 | Tärkeää on yleisesti Oulu testilab ympäristöön, missä voi taitata aiheita ympäristöä lähtölänitä laitteita. Aktiivisesti mukana olennoin. H4 | Asiakkaiden tavoitteiden mukaisen tuotten valmistaminen. H4 | Myrinnis auttau. H4 | Vaikutukset arvopaperiseen. |
| Ollaan pyrytessä semmossa lyhyillä suhteilla huomaavan totta kaikkein, kaik niin täällä sanavaisan on, kenen kanseen ollaan joutuva ja hoitaa siinä hommanne lyhyin, niin se on varmasti ollut kanavan semmoinen, että pareminen ollaan olut päästey siona, ko olla liitetty jollakin myyntireisuille... H4 | Myyntireisuus paremmi pääsee innen (sairaanlakokonteiin), kun hou hyvä sekoite sanavienlähtölänitä ja hoitaa työ hyvin. H4 | Myrinnis auttau. H4 | Vaikutukset kanavien. |