

DATADONOR

Crowdsourcing health care through digitalization

Appendices

MASTER THESIS
JORIS HENS

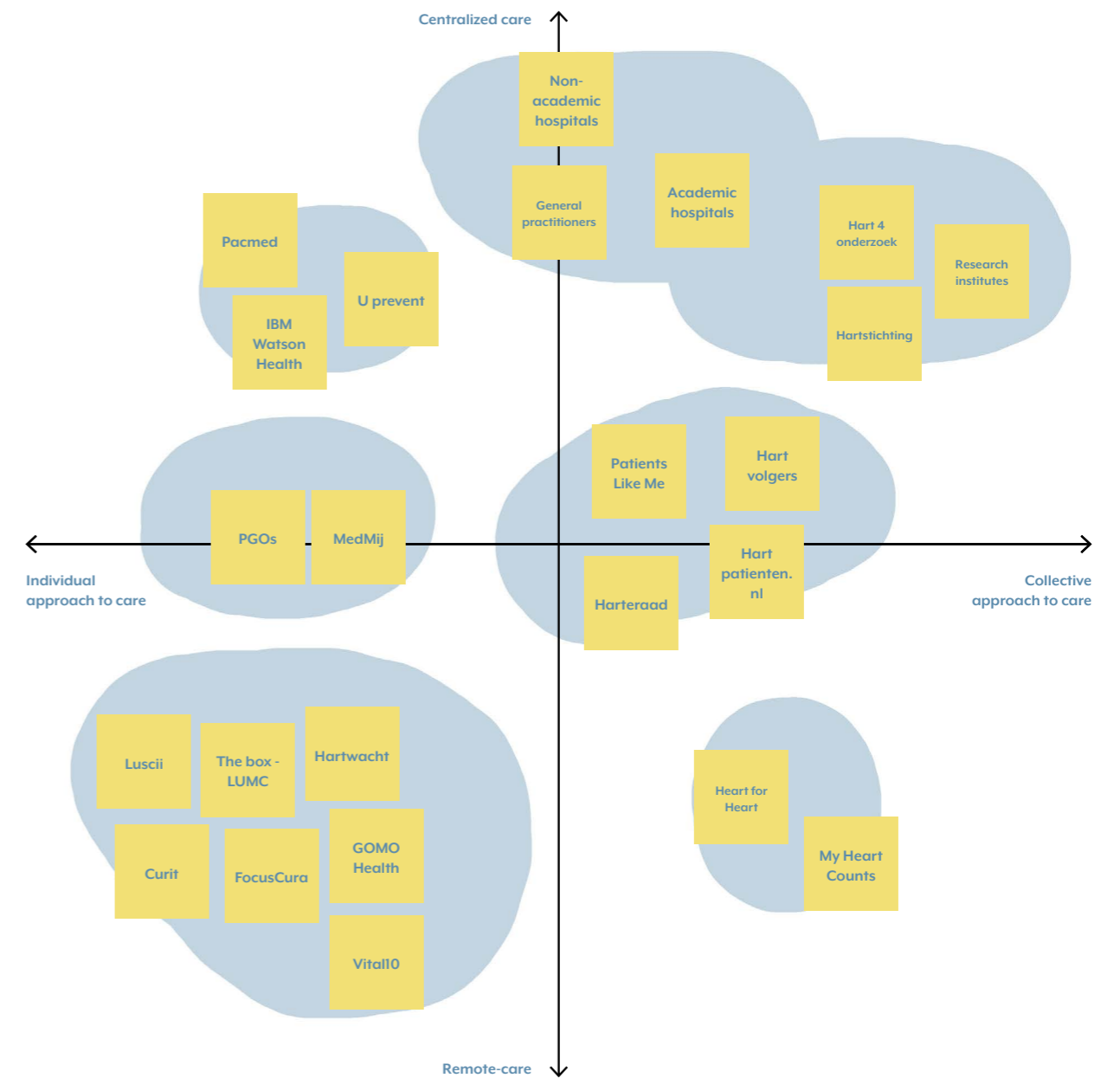
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APPENDIX A – PRELIMINARY RESEARCH

A.1 MARKET ANALYSIS

A market analysis is done to show how different actors in the Dutch health care industry fit in the health care framework created. This analysis can later in the project be used during the FHC use case to identify potential partners.



A.2 NEW ENTRANTS IN HEALTH CARE SECTOR

The commercial, IT and health care industries are continuously merging which results in new entrants. Non-traditional health care companies such as Apple, Google, Amazon, Microsoft, Philips and IBM are entering the health care sector and are attempting to dominate the home health space and stimulate public health systems to make care more accessible and affordable (Forbes, 2019).

Examples from practice

Amazon in health care

Amazon Health is investing heavily in using machine learning for health care systems. The physical architecture of these systems can be extremely expensive for health care providers. By entering this market, Amazon wants to provide offerings that enable health care providers to use advanced machine learning system in a scalable and cost-effective way (Harris, 2018).

Apple Health

Apple has made clear that the health care industry will be a key area of future growth. With an already existing network of apps, services and wearables they want to create a health care environment that works seamlessly with each other (CBInsights, 2019). By combining wellness and health they want to make health care a more regular habit and check-in. Some examples showing that Apple is active in the health care domain:

- Apple's Personal Health Record should provide patients a platform where they can manage medical data and health data generated by wearables. Currently, there are 120+ health care institutes part of Apple's health record beta.

- Apple ResearchKit allows medical researchers to use iPhones to conduct clinical studies. The ResearchKit could make recruitment easier, large scale studies more feasible, simplifying the onboarding of a clinical study, enable remote monitoring and diagnostics and gather medical data more frequently instead of during periodic visits (CBInsights, 2019).

- Teaming up with insurance company Aetna. Aetna teamed up on an iPhone and apple watch app that provides rewards (e.g. earning a free apple watch) to members who engage in healthy behaviors like regular physical activity and getting enough sleep (Farr, 2019).

- The Apple Watch 4 series is designed to inspire you to live a healthier life by supporting you in physical and mental wellbeing. It can also monitor your heart rate throughout the day and Apple is making progress in trying to detect unusual heart rates for preventive diagnostics.

The same as Amazon, Apple can afford to dive deep in the health care sector because they have a revenue stream that is large and diversified. This makes it possible to create solutions where traditional health care providers don't have the resources for.

"If you zoom out into the future, and you look back, and you ask the question, 'What was Apple's greatest contribution to mankind?' It will be about health. We are democratizing it. We are taking what has been with the institutions and empowering the individual to manage their health." Tim Cook

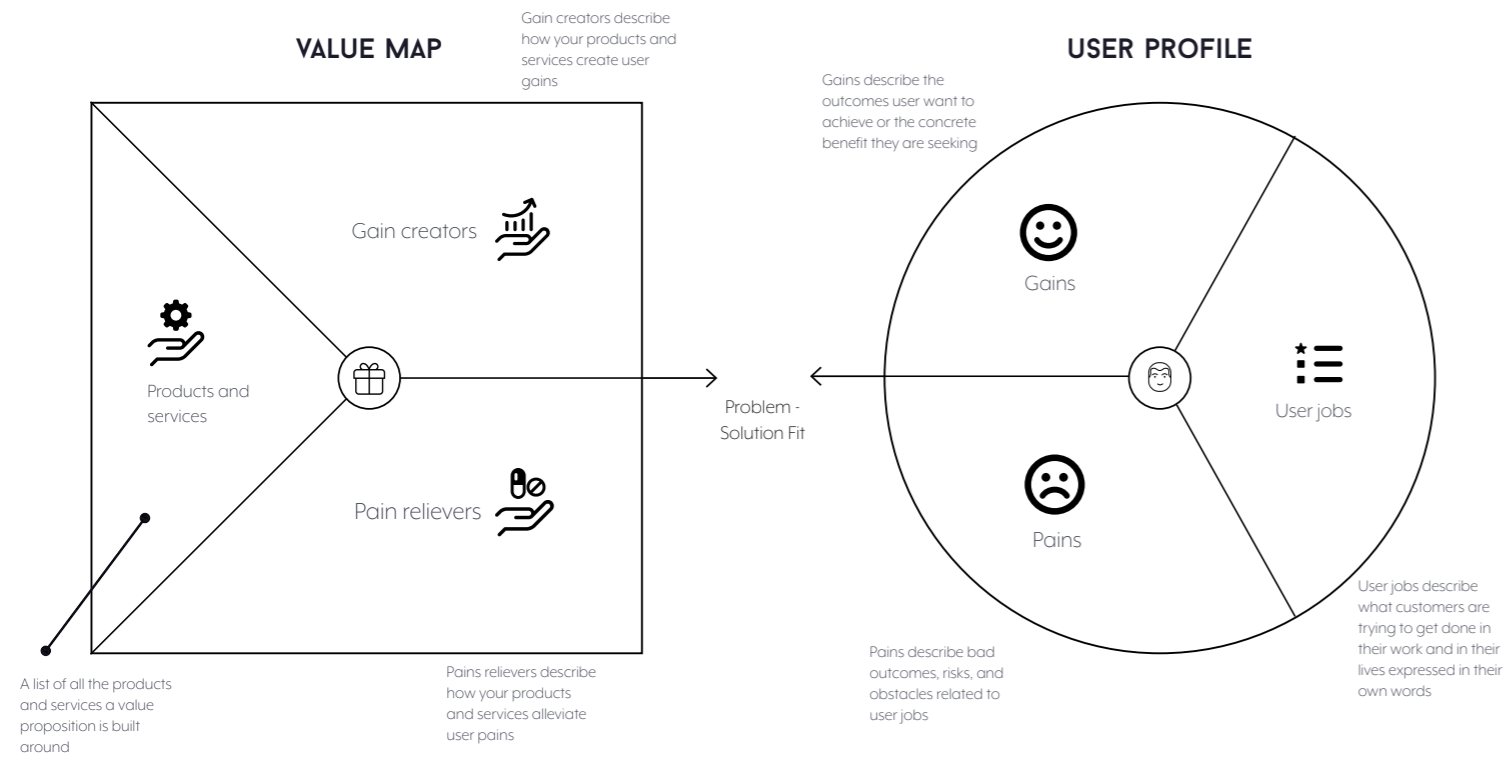
Telemonitoring services for CVD

'The box' in Leiden University Medical Center (LUMC) is a good example of a hospital initiative moving towards a more individual approach to improve clinical care. HartWacht of CCN and Lusci of FocusCura are also a good example of self-care initiatives. The difference between 'The box' and HartWacht and Lusci is that the latter are independent parties that collaborate with other hospitals. Second, hospitals have invested heavily in building EHR which they could link to PGOs in the near future.

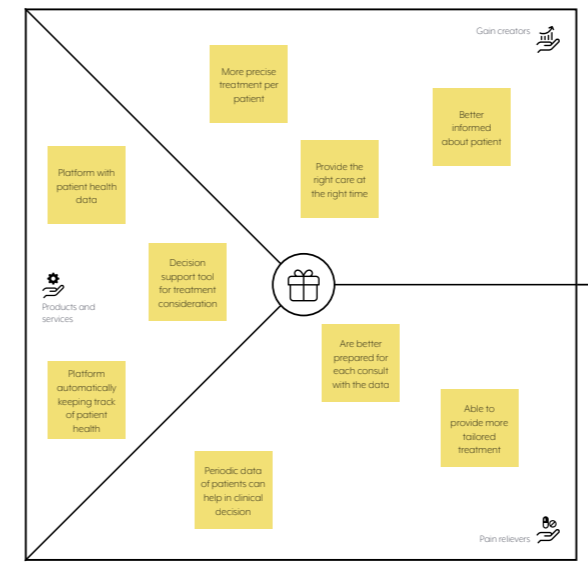
As introduced in chapter 2.5 predictive analytics tools are being developed using myriad data from different sources. U-Prevent, Pacmed and IBM Watson Health are good examples of initiatives that are creating these tools and are working closely with care professionals to integrate them into daily work. Patient health data of self-care initiatives, both from hospitals and independent companies, has the

potential to contribute in building predictive models as well. This means that an individual patient who generates health data can be an important player in improving not only his own care, but also that of others. The right bottom corner in the third matrix shows this link between self-care and public health research initiatives. Two interesting examples that create this bridge are Heart for Heart and My Heart Counts which provide a platform where you as an individual can share your PGHD for CVD research while receiving feedback on your data. Overall, a more interoperable cardiovascular domain is evolving. A good example is the Dutch CardioVascular Alliance (DCVA) which is an alliance that brings together leading organizations of scientists, patients, academia, health care professionals, industry and government. By combining forces, they have the ambition to lower the cardiovascular disease burden by 25% in 2030 (DCVA, 2019).

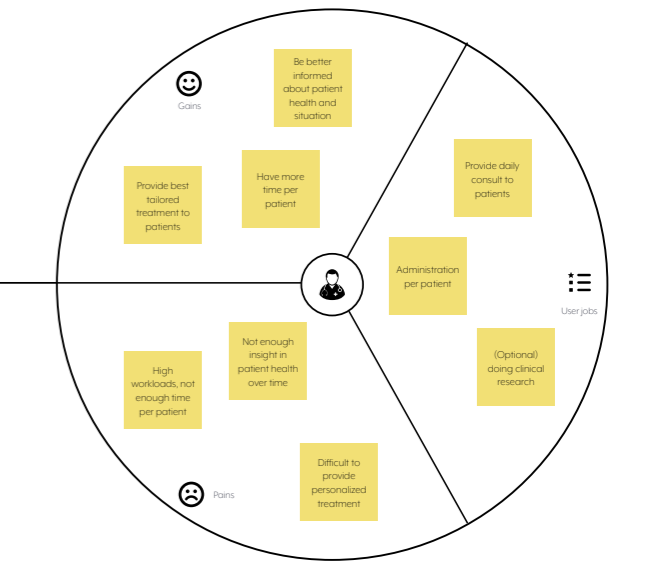
APPENDIX B - INITIAL VP



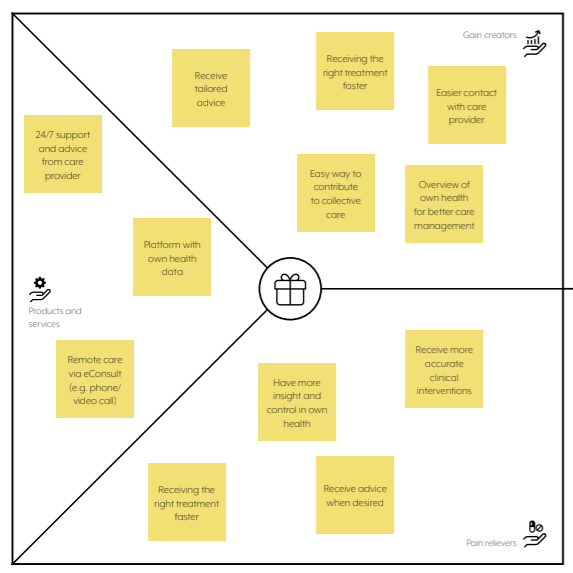
THEORETICAL VALUE MAP (CARDIOLOGIST)



THEORETICAL USER PROFILE (CARDIOLOGIST)



THEORETICAL VALUE MAP (PATIENT)



THEORETICAL USER PROFILE (PATIENT)



APPENDIX C – INITIAL VALUE FLOW MODEL

INITIAL VALUE FLOW MODEL

Core value proposition

The core value proposition includes the end-user and actors who exchange value directly with the end-user.

Complementary offerings

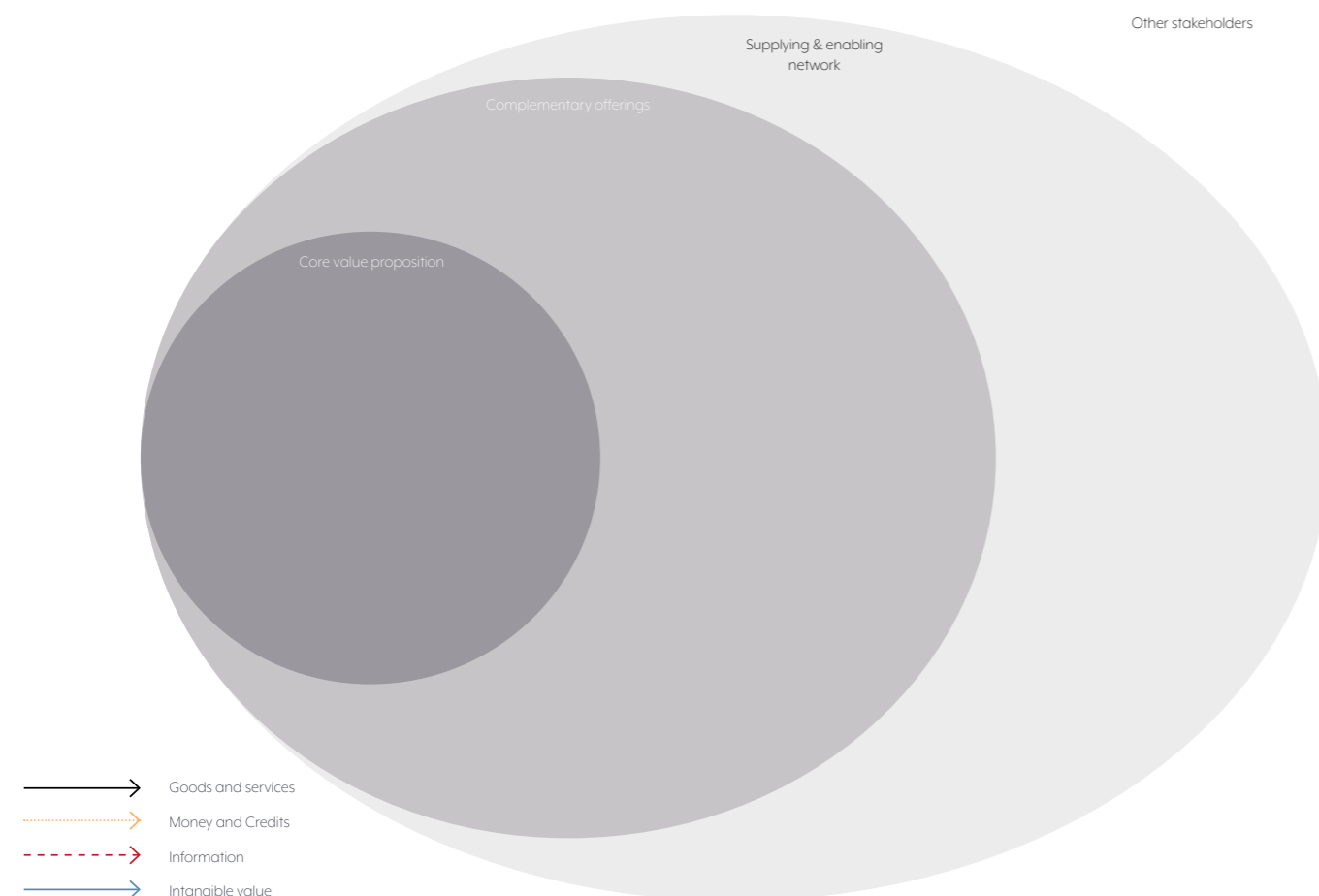
Complementary offerings can increase the value of the total offering for the user. Actors in this section are not core to the system, but can have direct contact with the users. The value proposition can still work without these complements. For example, additional accessories for an iPhone are complementary offerings.

Supplying and enabling network

This section incorporates actors that deliver components for the integration into the value proposition (e.g. hardware suppliers) or actors that enable the value proposition (e.g. platform providers).

Other stakeholders

This section incorporates actors that are not directly involved in the value proposition but are affected by it.



KEY RESOURCES

What are key resources that are necessary to deliver the value proposition? Resources can vary from people, technology, products, equipment, information, channels, partnerships, alliances and brands (Ouden den, 2012).

People

- Patients for care and data
- Cardiologist for knowledge and time
- CVD expert team for knowledge and time
- Clinical researcher for knowledge and time

Technology

- Predictive analytics for personalized treatment
- Personalized algorithms for personalized treatment
- Telemonitoring for data and remote care
- Cloud-based data sharing for data exchange

Information

- Patient health data for research and care
- Clinical care knowledge for care

Products

- Telemonitoring devices for health monitoring

Channels

- Digital platform for data and care exchange

Partnerships

- System providers for digital platform
- Service providers for 24/7 care delivery
- Telemonitoring device supplier for devices
- Insurance company for money

KEY ACTORS AND DRIVERS

Actors are identified that contribute to the initial value proposition. Then, drivers are described per actor and are goals actors aim to achieve or what the interest and intentions are of actors. Because an initial value flow model is created, these drivers are assumptions and need to be validated during user research.



CVD patient

Receive personalized care



Other CVD patient

Receive personalized care



Cardiologist

Provide personalized care and manage workloads



CVD expert team

Provide personalized care and manage workloads



Clinical researcher

Receive more data for better research

APPENDIX D - USER RESEARCH



Insurance company
Healthier clients



Society
Healthier population, better contribution to society



Telemonitoring device supplier
More profit



Hospital
Better manageable workloads



System provider
More data and better manageable workloads



Hospital
More data and better manageable workloads



Service provider
Better manageable workloads



Government
Healthier citizens, less health care burden on GDP

TRANSACTIONS

In the ecosystem transactions between stakeholders can be realized. Transactions can be activities that originate with one actor and end with another, or resources, information or items that are shared or exchanged between two actors. Four different type of transactions are used:

- Goods and services; can be physical goods or services;
- Money and credits; revenue streams, can be monetary but also virtual;
- Information; can be knowledge, advice, information important for the value proposition, or raw data;
- Intangibles; e.g. experience, reputation, exposure, attention, increased wellbeing, drivers, motives

D.1 DESIGN RESEARCH RATIONALE

The research done is based on a theory proposed by Convivial Toolbox (Sanders, E. B.-N et al., 2012) which states that greater insights can be gained of what people need and want based on what they say, do and make.

The path of expression diagram showed in figure X explains the process of the research. It is a process that can be used for exploring past, present and future experiences. By utilizing the path of expression, you enable people to connect to what is meaningful from their past and present experience, and use that as a springboard for ideation about the future.

1. Observe and document current experiences
2. Recall memories from earlier experiences
3. Reflect on those memories and possibilities for the future
4. Create artifacts for future experiences

The first and second steps, also called sensitizing, were done by providing the participants a contextmapping booklet. During the generative interviews, the third and fourth step were included. By following these steps, latent knowledge can be accessed (latent knowledge refers to thoughts and ideas that we haven't experienced yet, but on which we can form an opinion on based on past experiences (Sanders, E. B.-N et al., 2012)).

CONTEXT MAPPING AND INTERVIEWS

For the contextmapping two different booklets were created, one for patients and one for cardiologists.

Patients

The aim of the booklet and follow-up interviews was to gain more in-depth insights in patient concerns, expectations, goals, needs or attitudes regarding their care process. This will give insight on what kind of patient and moment in the care process to focus on.

Cardiologist

The aim of the booklet and follow-up interviews was to gain more in-depth insights in cardiologists' concerns, expectations, goals, needs or attitudes

regarding the care process of their patients and the opportunities for using patient data in the care process.

Method

Participants

7 cardiovascular patients and 6 cardiologists (Erasmus MC, AMC, LUMC) participated in the research. Patients were relatives, friends or acquaintances. Cardiologists were contacted via LinkedIn or via an introduction by previous interviewees. The participants were selected based on the following criteria:

Patients

- Experienced a heart failure in the past 15 years
- Have a routinely check with cardiologist

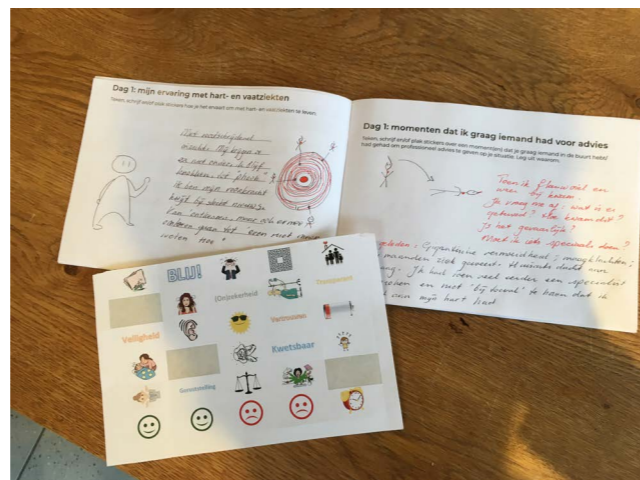
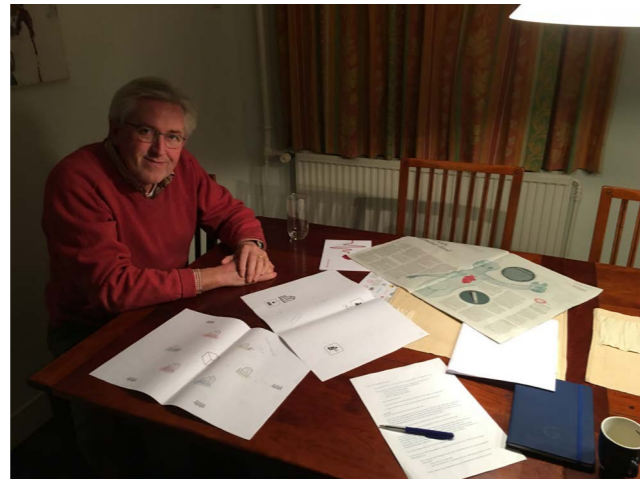
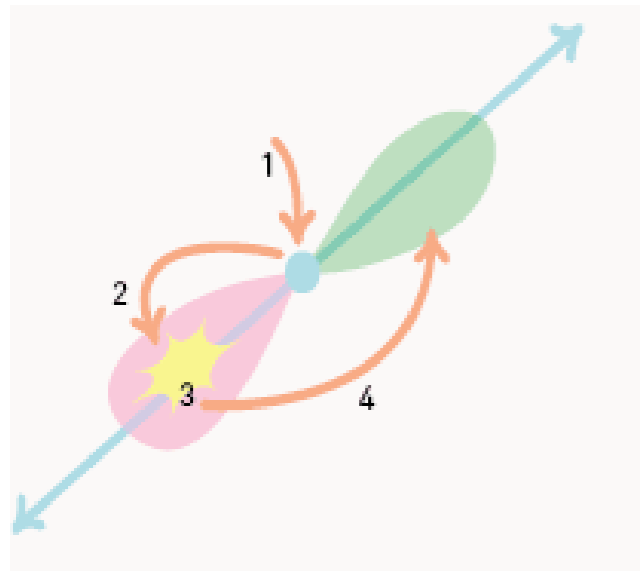
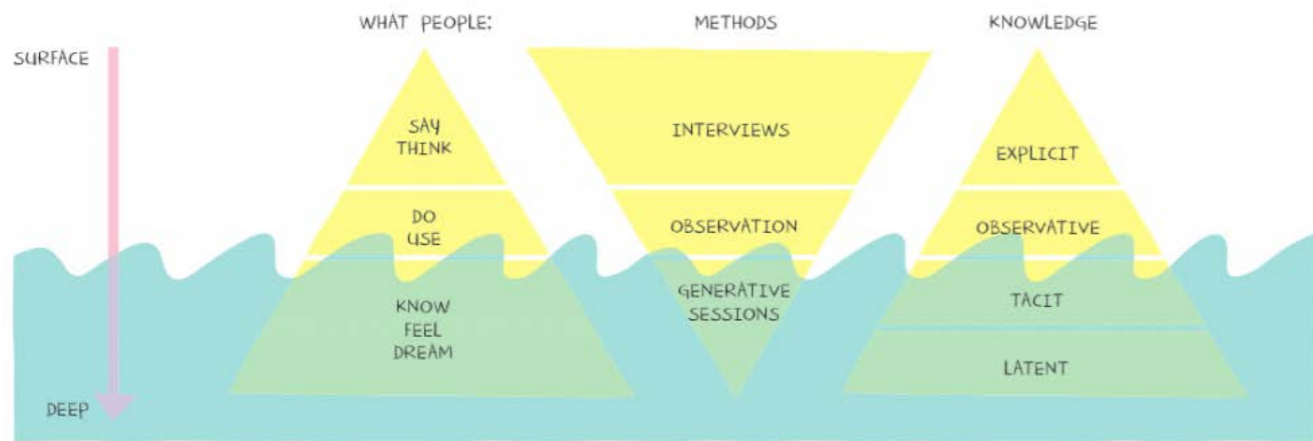
Cardiologists

- Work in second or third line of care

Procedure contextmapping

Filling out the booklet took 30-45 minutes. The booklet consisted of 7 exercise. To elicit interesting insights, attention was paid to making the booklet interactive. This was done by providing participants with selected stickers which they could use to express their emotions more easily. Participants were asked to draw, write and/or use stickers to express their answer. The visuals in the booklet were sketchy which invited participants to draw as well. Participants received their booklet via post so they could fill it out in their own time and surrounding. Before distributing the booklets, two iterations were held to optimize the exercises. The exercises were set up to gain insights in the following fields:

- Personal experience/journey with cardiovascular disease
- Interaction with cardiologist or patient
- Additional support in the care journey
- Desires regarding care process



Participants had a week to fill in the booklet and were asked to make pictures of the answers and sent them via WhatsApp to me. This way I could analyze the booklets and tailor the semi-structured interviews according to their answers beforehand.

Unfortunately, none of the cardiologists had the time to fill in the booklet that was provided since they were too busy with treating patients. 2 out of 6 did look into to booklet as a preparation for the interviews.

Procedure generative interviews

The generative interviews for patients and cardiologists differ in structure and tools used. The interviews were held in the homes or work area of the participants and lasted 60-90 minutes. Interviewing people face-to-face and in a familiar environment may allow them to be more comfortable expressing their opinions and feelings (Bolderston, 2012).

For the generative interviews, several tools were developed depending on the participant (patient or cardiologist).

Patients

The interview with patients was built up in three phases:

1. Discuss present and past experiences and feelings using input from the booklet;
2. Potential of telemonitoring service on current and past care process;
3. Discuss the concept of sharing health data for research purposes.

Three visuals were used to explain interview topics. At the same time, participants could use these visuals to provide (visual) feedback on the proposed telemonitoring and data sharing service.

Cardiologist

The following topics were discussed during the interviews with cardiologists:

- Opportunities, challenges and obstacles of using telemonitoring in the care process.
- Opportunities, challenges and obstacles of using

- patient data to improve care management
- The role of the cardiologists when telemonitoring and patient data are being implemented in the care process
- First steps towards a more preventive care.

Three visuals were used to explain interview topics. At the same time, cardiologists were able to provide feedback on the first concept of a product-service system (figure X). By providing them a first draft, they could better point out important relationships between stakeholders and what their desired role would be in the system.

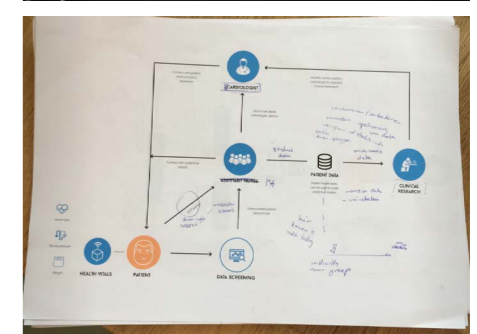
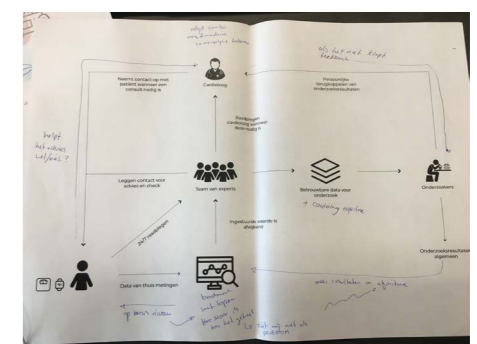
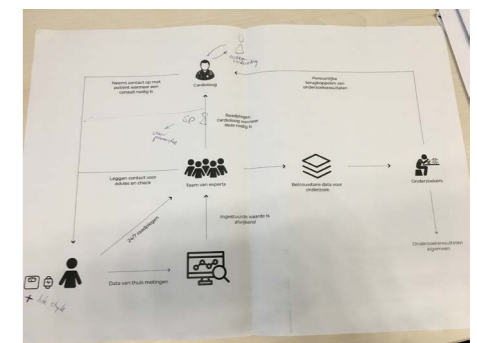


Figure X Results of generative sessions with cardiologists



Ik & mijn zorg

Hallo!

Ik ben Joris en ben momenteel aan het afstuderen aan de TU Delft voor de master Strategic Product Design. Het doel van dit onderzoekje is het in kaart brengen van wat mensen die leven met hart- en vaatziekten drijft en motiveert.

Ik ben erg benieuwd naar wie je bent, wat je doet en wat je bezighoudt. Er zijn geen goede of foute antwoorden, alleen maar 'jouw antwoorden'. Jij bent de expert van je eigen ervaring. Voel je vrij om de opdrachten in te vullen op een manier die bij jou past. In het boekje zitten stickers die je kunt gebruiken bij het invullen.

Je mag de opdrachtjes verdelen over een aantal dagen of alles in een keer invullen. Doe vooral wat jou uitkomt! Het zou fijn zijn als je foto's kunt maken van wat je hebt ingevuld en deze via whatsapp opstuurt.

Alleen ik zal inzicht hebben in de antwoorden. Dat betekent dat alles wat je invult alleen door mij verwerkt wordt tot anonieme inzichten die niet naar jou als persoon herleidbaar zijn.

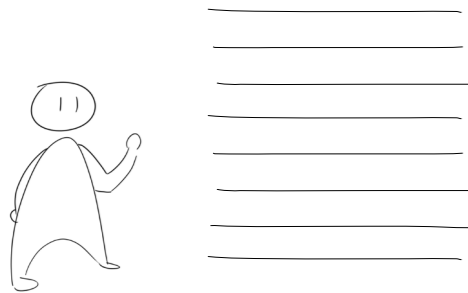
Als je nog vragen hebt over het gesprek of het boekje, bel of whatsapp gerust even met mij op 06-12434596.

Alvast bedankt en tot snel!

Joris

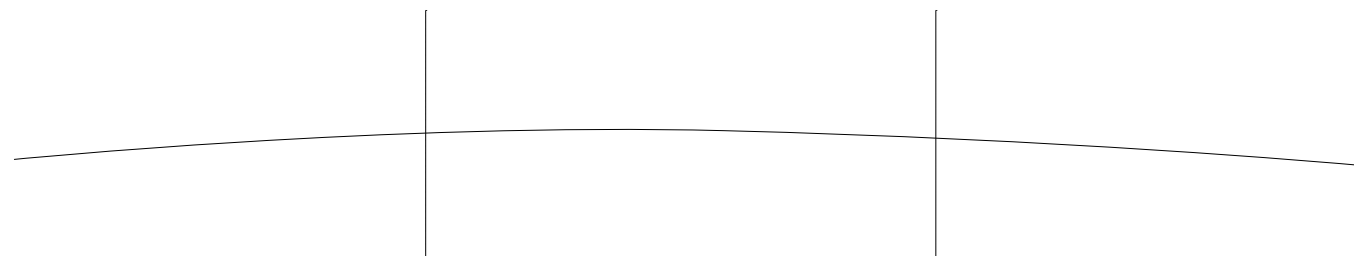
Dag 1: mijn ervaring met hart- en vaatziekten

Teken, schrijf en/of plak stickers hoe je het ervaart om met hart- en vaatziekten te leven.



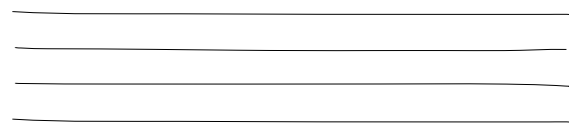
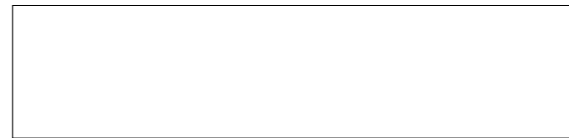
Dag 2: mijn bezoek aan de cardioloog

Teken, schrijf en/of plak stickers om te laten hoe jij je bezoek aan de cardioloog ervaart/hebt ervaren (dit kan bijvoorbeeld je eerste, meest gedenkwaardige of laatste bezoek zijn). Probeer het in kleine stapjes op de tijdlijn uit te leggen (ervoor, tijdens en na je bezoek).



Dag 1: dit betekent mijn gezondheid voor mij

Teken, schrijf en/of plak stickers om te laten zien wat jouw gezondheid voor jou betekent. Lig dit eventueel toe.



Dag 1: momenten dat ik graag iemand had voor advies

Teken, schrijf en/of plak stickers over een moment(en) dat je graag iemand in de buurt hebt/had gehad om professioneel advies te geven op je situatie. Leg uit waarom.

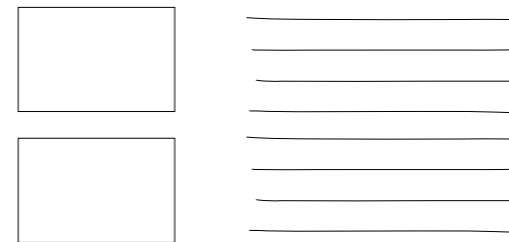
Dag 3: mijn cardioloog en ik

Teken, schrijf en/of plak stickers over je meest prettige en minst prettige moment(en) van samenwerking tussen je cardioloog en jezelf. Lig dit eventueel toe.



Dag 4: hulp op maat!

Stel, je kunt je gezondheidsgegevens beschikbaar stellen voor wetenschappelijk onderzoek om zo niet alleen de zorg, maar ook je eigen behandelproces te optimaliseren. Wat zijn volgens jou belangrijke onderwerpen waar men rekening mee moet houden? Leg uit waarom.



Dag 3: wie ondersteunt mij in mijn zorg

Teken, schrijf en/of plak stickers welke personen er allemaal betrokken zijn bij je zorg en geef aan wat je aan deze person(en) hebt gehad. Dit kunnen natuurlijk ook mensen buiten het zorgsysteem zijn.



Aantekening

Deze ruimte kun je gebruiken voor extra aantekeningen/opmerkingen/vragen die je te binnen schieten.



Bedankt voor het delen van
jouw ervaringen!

Wil je dit boekje meenemen naar ons interview?

D.2 DATA ANALYSIS METHODOLOGY

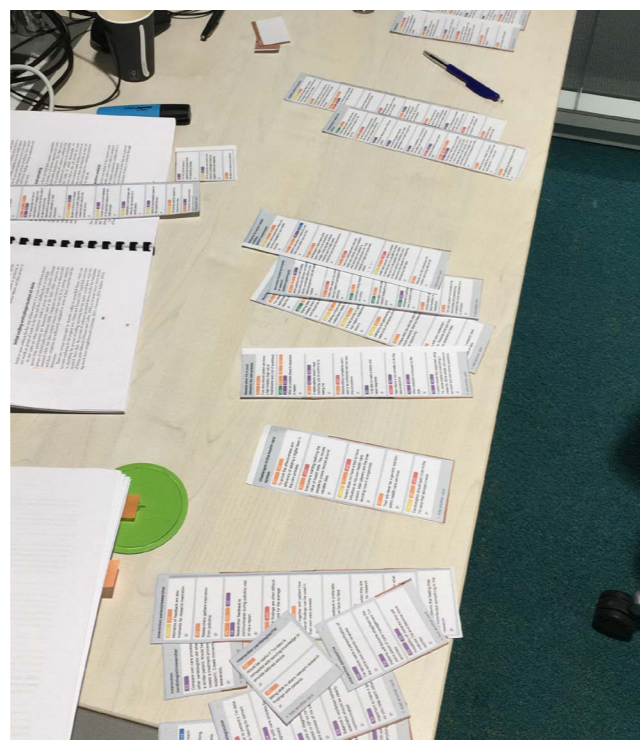
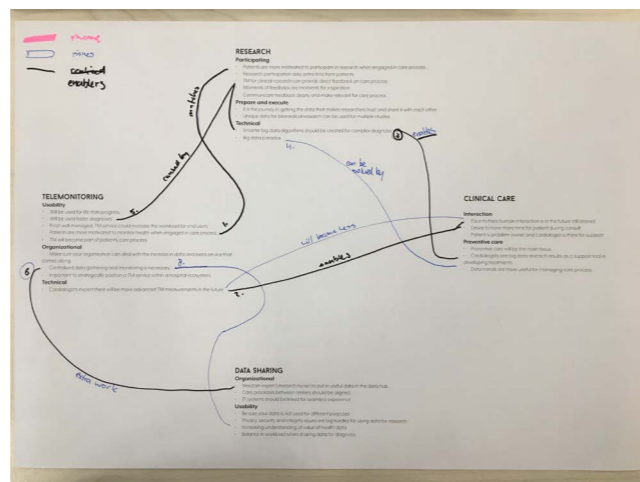
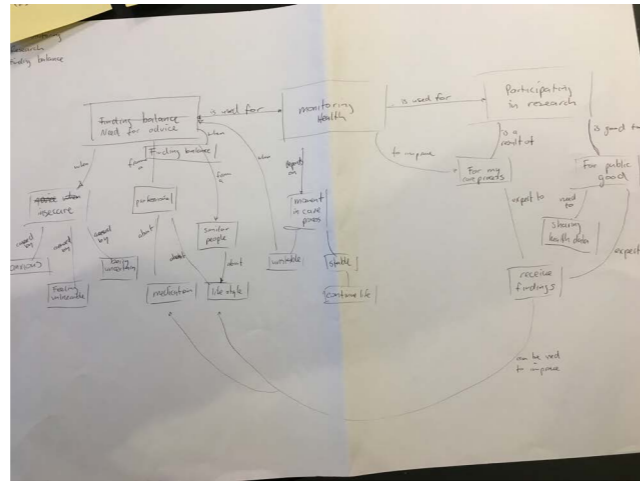
Before results will be shared different methods of data analysis that were used will be explained. The Grounded Theory Method is used to because of the heterogeneity of the collected data. This analysis resulted in various insights that will be categorized per stakeholder. Morphology psychology is used to uncover and structure motivations and needs of patients living with CVD regarding measuring and sharing health data.

GROUNDING THEORY METHOD

The booklets were summarized and used as input for the interviews. In total, 13 user interviews were recorded and transcribed. During analysis of the transcribes, patients were categorized into when they experienced their first cardiovascular event (0-5, 5-10, 10-15, 15-20 years). Cardiologists were categorized into which line of care they are active in (second or third line, third line cardiologists were also active academic research). The Grounded Theory Method (Glaser and Strauss, 1967) is used to seek out and conceptualize latent patterns and structures of the topic that is researched through ongoing comparison. This way categories can be identified out of data and potential relationships between them. It allows for deeper understanding of the phenomena that is being researched. First, categories are made out of data. Second, theoretical coding was done. This is the activity of creating integrative diagrams as seen in figure X. These diagrams force you into thinking about the categories as not static textual concepts, but as objects that relate to each other (Strauss, 1987).

MORPHOLOGY PSYCHOLOGY

Morphology psychology is developed by Professor Wilhelm Salber, from the University of Cologne in Germany (Salber, 2001). It's based on three psychological tensions that drive everyday human behavior (Melchers, 1997). Morphology is intended to explore holistic motivations of a phenomena as they become apparent in human experience and behavior. It uncovers motivational tensions behind every day human behavior which can be used to



build models of human motivation (Lönneker, 2007). Through morphological research it is found that people use products, services and brands to deal with these motivational tensions (Melchers, 1997).

Tension model

During my internship at service design consultant Koos Service Design I learned to work with morphology. Jules Prick and Robert-Jan van Oeveren, founders of Koos Service Design, mastered the use of morphology in their projects. They visualize research results in a so called 'tension model' which can be seen in figure X. This model is used to visualize and structure motives and needs of people. Since the model is psychological it should be easy to grasp which can feel like it shows obvious results. First, the dynamics of this model will be explained, then motives and needs it for the phenomena 'living with CVD' will be mapped using consumer research results.

Primary tension (acquisition vs. transformation)

The primary tension describes the constantly working psychodynamic tendency of acquisition and transformation. Acquisition is the search for simplicity, certainty and security. In contrast stands transformation which is the drive to move on, to

reach for new experiences, to cultivate, and to shape something and be shaped.

Secondary tension (impact vs. structure)

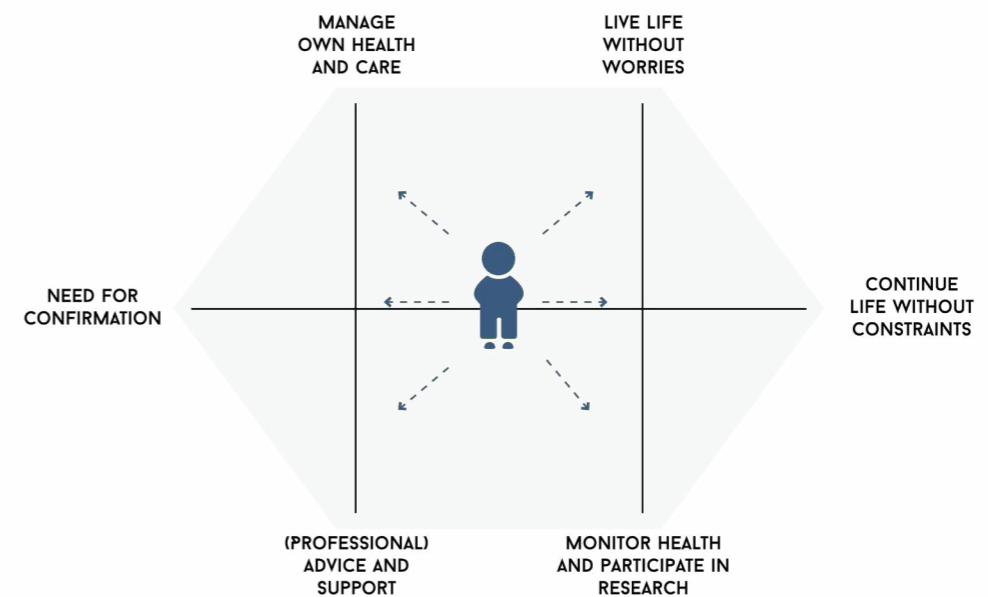
The second tension describes the tendency between impact and structure. Impact is having the need to have an effect on something or someone. Structure having the need to have everything ordered, and having to deal with the effects of the outside world, rules and society.

Tertiary tension (ambition vs. competence)

The third tension describes the tendency between ambition and competence. Ambition constitutes the trend of unhampered growth, of an ideal world and the desire to make one's dreams come true. This demands competence on the other side to have the right necessary support, the right equipment, backup and/or patronage.

Such a tension model can be used as strategic framework to identify areas of opportunities, areas you want to move into, brand positioning, position concepts, etc.

In the paragraphs all findings resulting from this analysis are presented.



D.3 PATIENT FINDINGS GTM

[I aim to put more quotes in the end report]

The GTM analysis of patients revealed five main categories which will be discussed separately. These categories will be used to develop key insights that will be used in the conceptualization phase for idea generation and as design requirements for concept selection.

Searching for balance

After patients experience a cardiovascular event they need to find a balance in medication, physical and mental well-being and life style. This is done with help from various care professionals (e.g. cardiologist, general practitioner, physiotherapist). Findings this balance varies a lot between patients, this makes it difficult for care professionals to tailor treatment plans. Often, patients pay more attention to their health and life style when they are in an unstable phase.

“It took me around 2-3 years to find the right balance in medication, but having many different types of medication I understand this takes time.”

“Especially at the start I had a lot of side effects. During this period, I had a lot of contact with the nurse to discuss side effects and look for alternatives.”

Desire for monitoring health depends on context

As with the cardiologists, patients’ desire to have a telemonitor service also depends on the context. All patients did not see the point of measuring and sharing their health currently since they did not experience any complaints and have a good balance in medication, physical and mental well-being and life style. Moments when patients feel vulnerable, uncertain and/or anxious are moments when they desire professional feedback, advice and/or confirmation regarding their health status. These moments occurred mostly during rehabilitation until they were fully recovered. For most patients being recovered means having the right balance in medication, physical and mental well-being and

life style. During rehabilitation, these are also the three areas where professional advice, feedback and confirmation is desired. The extent in which patients desire professional support varies a lot. This means that every patient needs its own personal rehabilitation plan.

The desire to monitor health declines over time. This has two reasons, first as patients’ well-being increases, patients don’t see the value of constantly checking your health. Second, if you feel well you don’t constantly want to be reminded that you are a patient.

“Right after my heart attack I bought a blood pressure device to monitor myself daily. As time passed, I used it less frequent and at one point I did not use it at all anymore.”

“A TM service would especially be nice in the period after the incident where you need security and confirmation. After finding the right balance not anymore.”

Open in data sharing

All participants were fine with sharing their health data for research purposes. Contributing to research is something all participants think is a good thing to do. Although patients are fine with sharing their health data, issues like privacy, data security and staying anonymous are still important. In addition, care providers should be transparent in what and where the data is being used for. Some patients would like to have control over their own health data, while others said they don’t want to be bothered with it after giving consent.

“I’m just a small crumb in the system, then let me be a crumb.”

Being involved in research

When patient share their health data for research they would like to know how their data contributed to the research. Most patients would like to know what the results mean for their own care process. In addition, sharing research findings should be done

thoughtfully. For example, when results have a big impact on a patient, they want to hear the results from a professional and not from a computer when they are sitting at home.

“And what would these findings mean for my care process?”

“Maybe it is interesting to hear if my research results deviate from similar patients.”

“It has everything to do with involvement. If you are interested in something you will have more motivation to do your best. I would like to know if my contribution has been useful or not.”

Key insights

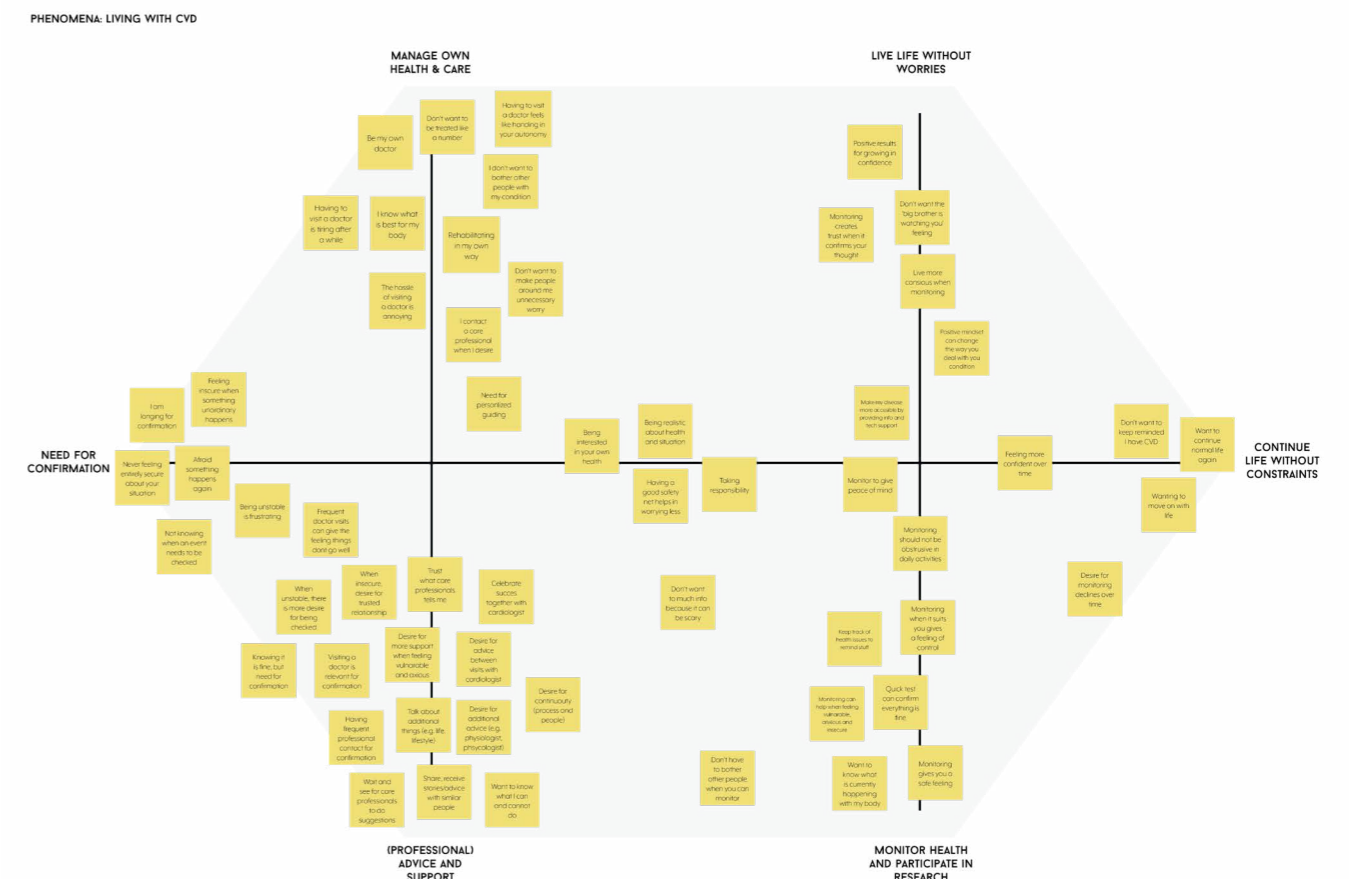
Four key insights are created out of the categories and will be used during the conceptualization phase of this project. The key insights are:

- Patients have most desire for support and advice when looking for balance in lifestyle and medication
- Patients do not know and experience the value of own data
- Patient health engagement varies over time
- Patients are willing to share their health data if that means contributing to improve health care and help others
- Patients can have difficulty with finding the right lifestyle/medication balance once diagnosed with CVD

D.4 PATIENT FINDINGS MORPHOLOGY PSYCHOLOGY

Relevance tension model ‘living with CVD’

To structure motives and needs of patients living with CVD a tension model was created which is visualized in figure X. This model uncovers differences in patient motives and needs in living with CVD derived from



customer research. These motives and needs can be used during the conceptualization phase to develop ideas and as criteria to compare concepts. The model had several iterations which were done with the company mentor and a PhD candidate who has experience doing research with CVD patients.

Primary tension – Need for confirmation vs. living life without constraints

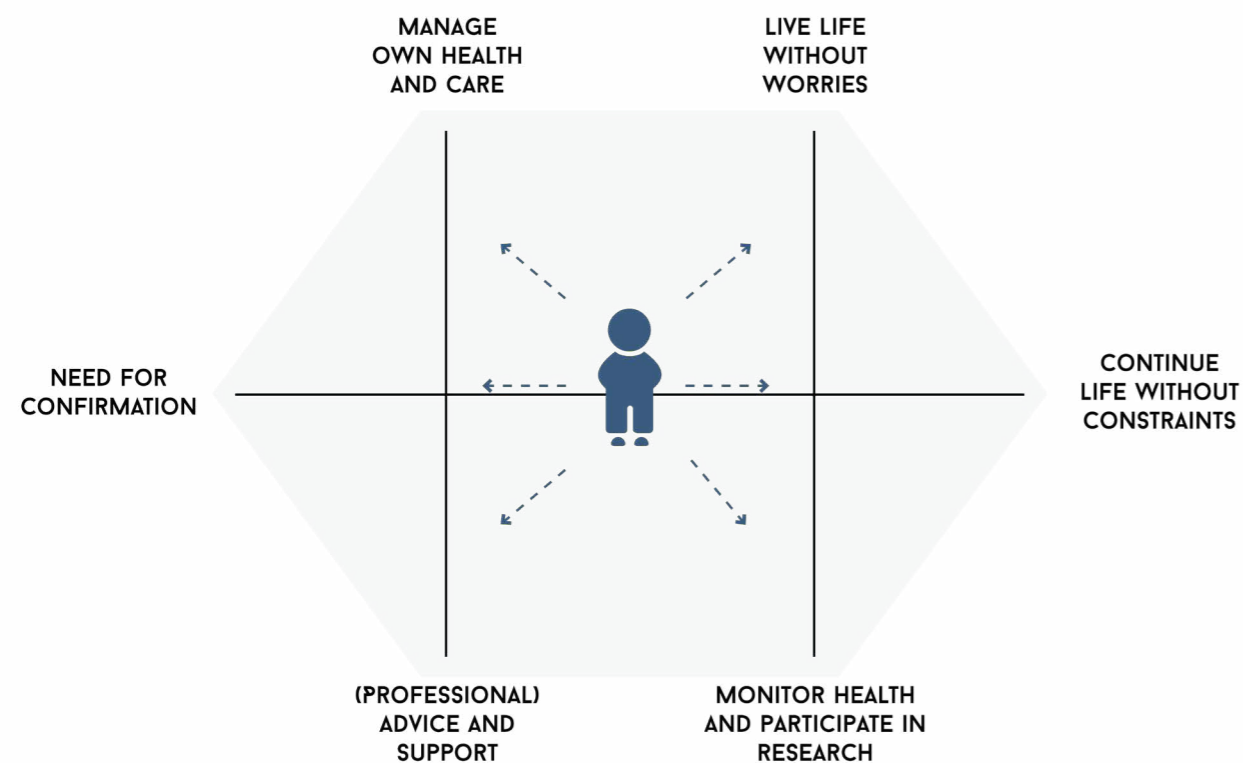
First, the ‘acquisition’ was unraveled which describes the basic need everyone is talking about. The basic need for people living with CVD is wanting the certainty everything is fine with your health. Contrary to this is the desire to move on with your life without constraints and not wanting to constantly be reminded you have CVD. For instance, you recovered well from a CV event and are focusing on picking up life where you left it. Running was always a hobby of yours, but now you experience moments of uncertainty regarding your health when you go running. To be able to pick up life again you want confirmation on what you can and cannot do.

Secondary tension - Manage own health and care vs. (professional) advice and support

The second tension describes the drive to have control over your own health and care process and not wanting/having to involve and bother people with my condition. On the other side there is the desire for (professional) advice and support that is necessary to guide you. For example, when you have CVD you sometimes want to eat unhealthily, but when you do this to often, your family might become concerned and try to restrain you from eating unhealthy food (which is of course better for your health).

Tertiary tension - Live life without worries vs. monitoring and participate in research

As a CVD patient you have the desire to live life without having to worry about your health. To be able to do this, occasionally you need to monitor your health or participate in research. For example, when you



start experiencing arrhythmia you need to carry a holter monitor for a week so the doctor can research what kind of arrhythmia you have to decide the best treatment procedure.

Key insights

- CVD patients' motivations and needs regarding advice, support and monitoring are fluid and respond to context and health. This should be considered when developing self-care solutions.
- The tension model can be used to create need based persona's or compare concepts later on in the project.



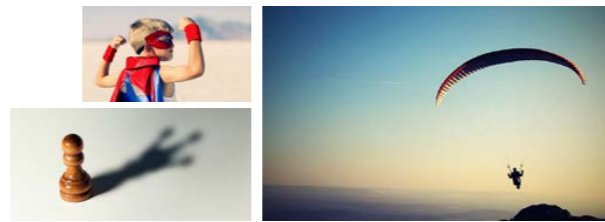
[I want to put more user research quotes in this model]

NEED FOR CONFIRMATION



"I WANT TO KNOW IF MY HEALTH IS GOOD"

CONTINUE LIFE WITHOUT CONSTRAINTS



"I WANT TO LIVE LIFE LIKE I HAVE NO CVD"

MANAGE OWN HEALTH & CARE



"I CAN TAKE CARE OF MYSELF. I KNOW WHAT IS BEST FOR ME "

(PROFESSIONAL) ADVICE AND SUPPORT



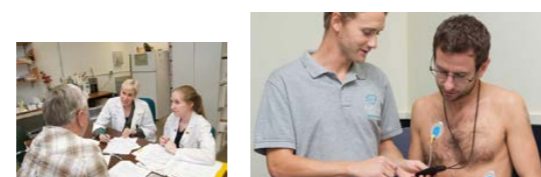
"I NEED SOMEONE TO KEEP AN EYE ON ME AND TELL ME WHAT I CAN AND CANNOT DO"

LIVE LIFE WITHOUT WORRIES



"I WANT TO BE CONFIDENT WITH WHAT I AM DOING "

MONITOR HEALTH AND PARTICIPATE IN RESEARCH



"I HAVE TO MAKE SURE I AM DOING FINE"

D.5 ADDITIONAL RESEARCH - JOURNEY MAPPING

To better understand the patient experience of searching for balance in medication, physical and mental well-being and life style, a journey map was created together with a cardiovascular patient. This person is a cardiovascular patient since 1999 and takes several types of medication. In June 2018, the patient quit smoking after 40 years. This is also the moment when the patient started to experience more frequent arrhythmia which resulted in an imbalance in medication, physical and mental well-being and life style. The journey map that is co-created with the patient zooms in on the period the patient stopped smoking until a second opinion for research was being asked for. Before doing the journey mapping session, the patient was asked to write a small diary about three key moments in his experience since he stopped smoking.

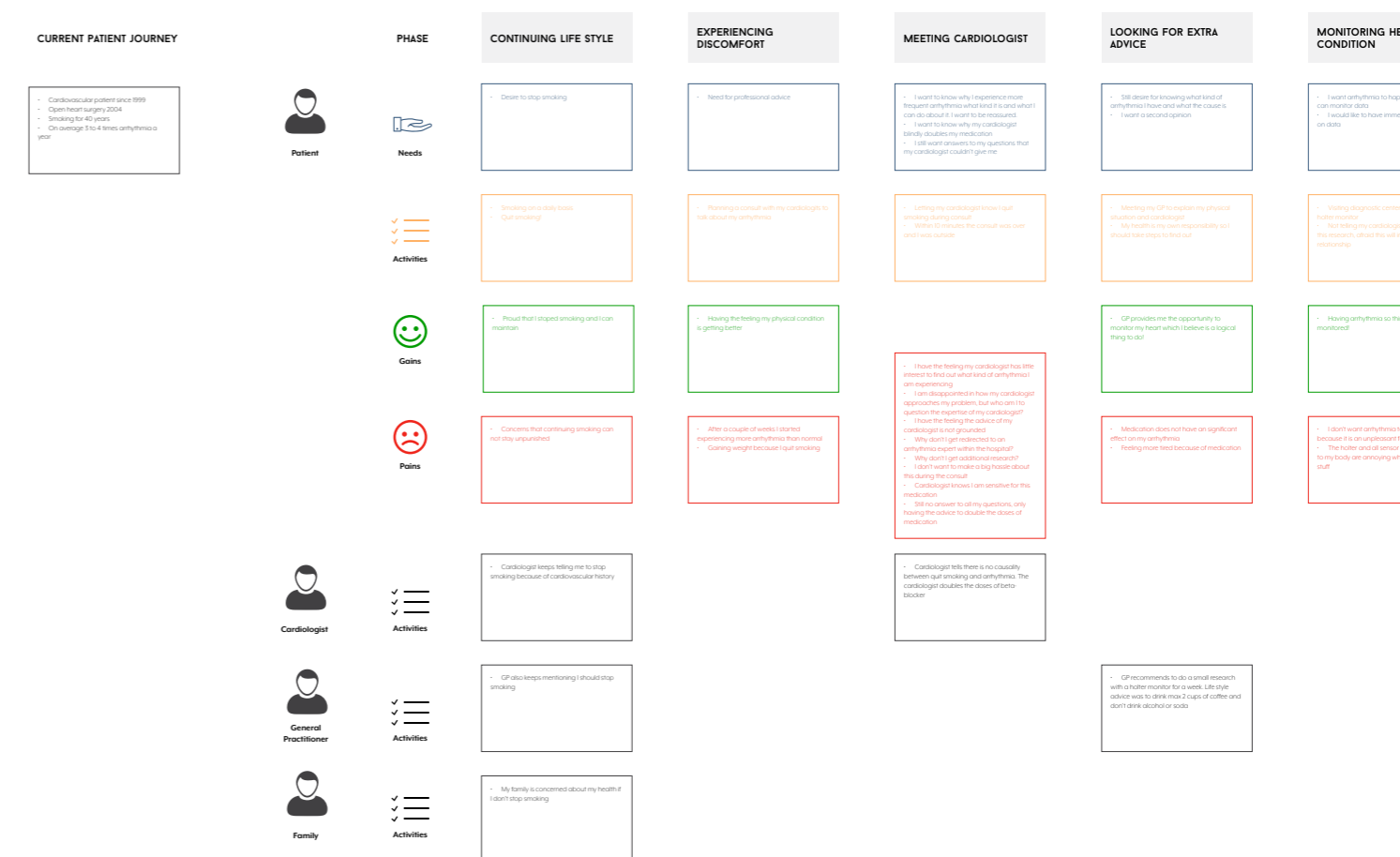
FINDINGS

Research can influence relationship

The patient was not satisfied with how his cardiologist handled the situation. Increasing medication without trying to find out what the cause is of his arrhythmia was very unprofessional in the eyes of the patient. The patient expected he would receive more information on what suddenly causes his arrhythmia, what kind of arrhythmia he is experiencing and what steps he has to take to control it (e.g. medication and/or life style). Currently, the advice of his cardiologists was not grounded. This experience damaged the trust relationship the patient had with the cardiologist.

Unclear research findings

The research findings the patient received from the GP were not useful since it did not provide the patient with concrete advice or steps to take. The hard copy received from the GP only raised more questions because of how the data and findings



were presented. This left the patient in even more confusion.

Long waiting

It took over 4 months before the patient was monitored from the time he experienced an increase in arrhythmia. Even after receiving the results questions were not answered and no advice was given. During this time the patient lived in uncertainty and was physically and mentally out of balance.

Limitations

The journey map was created with a single patient which makes it difficult to generalize findings.

[Journey will go to the appendix]

D.6 CARDIOLOGIST FINDINGS GTM

Improved care management is expected

Cardiologists expect that using telemonitoring, patient data and predictive analytics in the care process can add value to both the patient and doctor experience. By having longitudinal health data of patients, it is easier for doctors to timely intervene and adjust a treatment plan before an event occurs. This creates long term value for the patient.

"I expect data will enable me to do early diagnosis, prevent implications and improve treatment."

Good data management is essential

When you provide a 24/7 telemonitoring service to patients, it is important to understand patient's expectation regarding this service. In addition, a hospital has to make sure it can deal with all incoming data. Currently, incoming data that cause an alarm need to be checked, analyzed and put in the Electronic Health Record (EHR) manually because algorithms cannot do this yet. A hospital needs skilled people (e.g. research assistants) to do this, especially if the data will be used for predictive analytics it is important data storage is done accurately. Cardiologists don't want to be bothered with all incoming patient data, they expect only to see important data that need a professional eye. If in the future more telemonitoring services will be deployed, hospitals have to have a plan on how to cope with this flood of data and who is going to analyze it.

"You have to make sure you can deal with all sensor data that is coming in. When you say you monitor patients 24/7, people expect a 24/7 service."

Technology as supporting tool

Cardiologists see telemonitoring and predictive analytics as a support tool for better diagnosing and during decision moments in treatment. The tool will help them to provide patients with more personalized treatment plans and track progress. They still want to have control over the treatment plan of a patient

and not let technology decide what a patient should do. They see themselves as the translator between research results and what they mean for the patient and their care process. Cardiologists don't expect these technologies will replace them, but it will shift where and how they can deliver care to patients (e.g. e-consults). They expect it will help them to better manage preventive care.

"Use of sensor data will lead to early detection of changes in the disease process, this can be used to be able to provide timely adjustments or recommendations in lifestyle, medication or other interventions."

Patient-cardiologists-telemonitoring relationship

Cardiologists expect that patients will get used to the extra piece of care that is provided with a telemonitoring service. It is important patients are educated in how a monitoring service is organized and how responsibilities are divided. Cardiologists don't want patients to over-monitor themselves. Data that patients generate could potentially raise a lot of questions which could create extra workload for the cardiologist. It is important to make the data comprehensible and useful for the patient's care process. For example, feedback provided to patients should focus on things that they can influence themselves, like life style.

Cardiologists want patients to become more involved in and take control over their own care process. Telemonitoring could be a great piece of extra care for patient to take this control and become more conscious about their own health.

Desire for monitoring will depend on context

A telemonitoring service will not be useful for all patients, cardiologists believe. It will depend very much on the physical and mental well-being of a patient and where the patient is in the care process. Moments where cardiologists see the most value is during unstable phases like post-operative, during revalidation and during periods of complaints.

APPENDIX E – PRELIMINARY DESIGNS

These are moments when patients have the highest need for professional contact because a balance in medication and life style needs to be found. When people are physically and mentally stable, most patients don't want to be confronted with the fact they are a cardiovascular patient and just live their lives. Another reason is that it could potentially make patients anxious for no reason ('you should not make healthy people sick'). It can also be of value for old people, people living far away, people who are less mobile or have a specific condition. Moments when cardiologists experience difficulties in diagnosing are also moments monitoring can give them better insight.

"Patient who don't experience complaints don't have the desire to monitor their health. They don't constantly want to be confronted with the fact that they are a cardiovascular patient and just live their life."

Cardiologist has final responsibility

A cardiologist sees himself as the final responsible person for a patient. Only when the expertise of the cardiologist is really necessary he wants to be 'bothered' with a patient. This means that when the patient wants advice are support in less urgent situations, other stakeholders in the ecosystem should

provide help. During interviews it was discussed that the physician assistant or the general practitioner could take this role

Key insights

Four key insights are created out of the categories and will be used during the conceptualization phase of this project. The key insights are:

- Cardiologists prefer longitudinal data because it allows them to provide better clinical care to their patients
- Cardiologists see themselves as final responsible and prefer not to be bothered with patients unless their expertise is necessary
- Cardiologists believe the patient is the problem owner and they are there to support and guide. The patient should take more responsibility and control over own health.
- Predictive tools are perceived as supporting tools during decision moments
- Cardiologists wants to be the translator between research findings and what they mean for a patient.

E.1 PRELIMINARY DIRECTION

After multiple (individual and collaborative) workshops, brainstorm sessions and iterations, 5 design directions are selected and worked out in more detail. The aim is to design an integrated solution to the design challenge where managing a healthy lifestyle and how health data can contribute to individual and collective health are all incorporated. The directions described in this section do not cover the entire design challenge but are individual parts of an integrated solution. This is done to verify what elements should be incorporated in the final direction. The final directions will be a combination of design directions presented below. What elements will and will not be used will depend on the validation phase which is presented in the next paragraph.

In all concept scenarios the patient is equipped with telemonitoring devices to measure their blood pressure, heart rate and weight. These devices can be used to generate patient health data which can be used to track patient health and improve clinical care.



DIRECTION 1: BECOME DATA DONOR

This concept makes it possible for you to become civil caregiver. Currently, there are civil caregivers that learn how to provide CPR so they can save lives in their own surrounding. But did you know your health data can also be used to save lives! By living healthy and sharing your data you not only save yourself, but also the people around you.

1. You apply online to become a civil caregiver
2. You measure your blood pressure, heart rate and weight once every two weeks and share the results for research.
3. You will be kept informed about how many people you helped with sharing your data. Your contribution is vital!

Expected value of concept

Social (patient and cardiologist)

Straight-forward idea and taps into altruism. Patient would probably like to contribute in helping

others. Individual value is not directly clear which might influence patient engagement. Cardiologists probably don't see a direct advantage for them unless data is also showed to them.

Organizational

FHC could work together with Hartstichting NL to target multiple CVD patients.

Technology

When collaborating with Hartstichting a add on their website should be designed and integrated. This is not difficult but could be costly.



DIRECTION 2: INCREASE ENGAGEMENT BY PLAYING

This concept makes use of gamification. Gamification is the application of typical elements of game playing to other areas of activity. In this case it will be used for a game that will stimulate you to live healthier

and where you can play together with fellow players (fellow patients) to fight cardiovascular disease by using your real-life health data (For example, in 2011 a group of online gamers collaborated to solve a puzzle (protein structure) in 10 days which occupied scientists already for 10 years. This resulted in a research breakthrough that contributed to cure HIV).

1. You apply online for the game which you can play on your phone or computer.
2. You can upload your real-life data on the platform. The healthier you are, the healthier your character will be.
3. Together with other patients you take on the challenge to fight cardiovascular disease. At the same time your data will be used for research to improve clinical care for cardiovascular disease.
4. In addition, your doctor can better guide you in your health and treatment with the data you uploaded.

Expected value of concept

Social (patient and cardiologist)

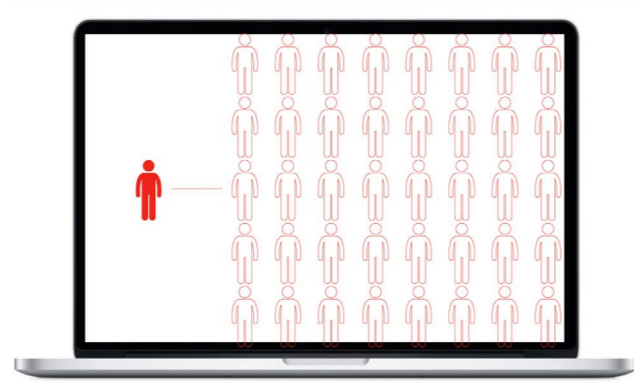
It can go two ways, or patients will like the concept because it makes the disease accessible in a more compelling way, or patients would not take it seriously. For cardiologist it can be a nice way to interact with patients more occasionally and easier.

Organizational

Like explained in chapter 2.4, it is necessary to involve care professionals in developing successful solutions. Especially with this concept it will be necessary to involve cardiologists, and other care providers to make sure valid health care elements are put into the game.

Technology

Once Creating an online application with CVD gamification elements into it needs. For this FHC should collaborate with parties that are familiar with these types of applications.



DIRECTION 3: SOCIAL COHESION WITH DATA

The moment you become a patient you can choose to become part of a digital community with patients who have the same conditions as you. You can find support and advice from people who also live with cardiovascular disease. This way you contribute to your own health and that of others.

1. When you share your data on the platform you can get in touch with a patient in similar situation or same set of conditions.
2. You can support each other by sharing experiences. For instance, you can learn what kind of lifestyle works for the other person or share what helped you in managing your disease.
3. By sharing your data on the platform, you contribute to better care and support each other in becoming and staying healthy.

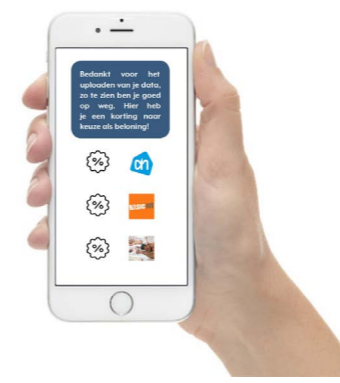
Expected value of concept

Social (patient and cardiologist)

Patients who experience more discomfort with living with cvd would desire more advice and guidance than someone who knows what to do, they just want to continue life. Sharing data on an online platform might be received as not safe. Cardiologists could refer patients to this platform to seek for peer advice which will save time for them.

Organizational

There are already existing social platforms where similar patient can get in touch. Maybe FHC could start a new one or collaborate with existing ones



DIRECTION 4: LIFESTYLE PROMOTER

The concept rewards patients with discounts on healthy products and services when living healthy (e.g. physical activity) and helping out fellow patients by sharing health data.

1. Together with your doctor you set up a plan to live healthier and maintain a healthy lifestyle.
2. By tracking sport activity, eating healthy and sharing health data with your doctor you will receive a discount on health products/services or activities. For example, healthy products in the supermarket (e.g. less salty products) or activities for your mental wellbeing (e.g. family activity).
3. In addition, your doctor can better track you and provide lifestyle and medication advice when necessary.

Expected value of concept

Social (patient and cardiologist)

Financial benefits could be a good driver for adults to live healthier. Although higher income people would probably be less triggered by small discounts. This could result in a gap between rich and poor cvd patients and therefore the validity of the data captured. Cardiologist have more insight in the lifestyle of their patients which they can use to provide better care

Organizational

For this concept multiple collaborations are needed which will take a lot of time and effort to organize. Creating partnerships with commercial parties can be tricky and time consuming.

Technology

How people receive discounts and when and where they can use them in their daily activity will be a challenge for technology.



DIRECTION 5: DATA EDUCATION

The hospital organizes workshops which educate patients on how continuous measuring and sharing their health data will increase their own health and that of others.

1. The moment you become a heart patient you will be invited to attend several workshops which will teach you the positive opportunities of health data.
2. The hospital will educate patients how to use the devices properly and guide them in living a healthy lifestyle.
3. After the workshops you would be able to measure and share data and live a healthy lifestyle independently.

Expected value of concept

Social (patient and cardiologist)

Being educated by showing the impact you can have can help people realize what their added value is. However, let patients participate could be tricky because it is a workshop where you have to be physically. In addition, it might make people more engaged at the start, but this might evaporate over

time. For cardiologists it might be a good workshop where they can send patient to if they don't have the time during consult to explain everything.

Organizational

Organizing workshops can be done in hospitals and organized by topic experts. There are enough people in the hospital with the right knowledge, although time and effort might be downside to organize such workshops.

Technology

Not much technology needed. Maybe online advertisement.



FINISH VISUAL!!!

E.2 VALIDATION AND SELECTION

All introduced directions achieve the design challenge to some extent. Further evaluation of the directions is needed to decide which direction is most promising. To decide which direction is the most promising, two validation techniques are used. First, 'weighted criteria' is used to rate the directions on relevant requirements. Second, an online questionnaire was created where seven patients, three cardiologist and fifteen Deloitte Digital Health and Creative employees provided feedback on the directions and rated them on likability. The potential fit with the requirement 'the proposition should support the collective approach to improve care while at the same time provide individual added value' will be the most important requirement in the direction selection process. This is because it reflects the design challenge most accurate.

VALIDATING BY METHODOLOGY AND STAKEHOLDERS METHOD

Weighted criteria

Before stakeholder validation is done, the technique of weighted criteria was used on which the directions could or could not show potential in the selected requirements. From the complete list in appendix X.X, 7 requirements were selected which are considered the most important to fulfil the design challenge. These criteria were validated with both the company and university mentor. The process was set up as followed: each of the requirements are weighted on a scale from 1 to 5 (1=least important, 5=most important). Next, each direction is given 1-10 points on each requirement. Finally, points are multiplied with their allocated weighting which result in a total score per direction. Points were given taking the comments of Deloitte Digital Creatives and supervisory team into account.

Stakeholder validation

In addition to using a methodology to evaluate the directions, different stakeholders were consulted. An online questionnaire was created where participants

were presented with a scenario to let them sensitize with the context the directions are aimed for. Next, the directions were individually introduced with a description and scenario in which it could be used. After each introduction and scenario, the participants were asked to rate the direction on 'how likely would you make use of this idea?' on a scale from 1-5 (1=most unlikely, 5=most likely). In addition, they had to clarify their answer. After all directions were presented, participants had to rate the directions compared to each other by making a top 5 (1=most interesting concept, 5=least interesting concept).

Evaluation

The weighted criteria method resulted in a clear victory for the second direction. This direction is followed by direction 4, and direction 3 respectively. The advantage of direction 2 over direction 4 and 3 is that it meets the highest weighted requirement to a greater extent (The proposition should support the collective approach to improve care while at the same time provide individual added value).

For each validation method a the top three of directions is created which can be found in figure X.X. As can be seen there is a minor discrepancy between the weighted criteria method results and questionnaire results.

The result of the concept rating of the Deloitte Digital colleagues will have less impact on the selection of the final direction since none of these participants is a cvd patient or cardiologist. The main reason to incorporate them in the questionnaire was to receive feedback on elements of the directions which can be used for further improvement of the final direction.

Patients rated 'become a data donor' the highest and when looking at their explanation it was mainly because patient are happy to help other people if they can. Therefore, altruism is an important aspect to incorporate into the final direction. Still, this direction scores relatively low on criteria that are important for this project. The key issue with this direction is that it does not provide individual added value. This could result in a higher rate of abandoning data sharing

overtime. One of the comments was that if measuring and sharing your data was made really easy, this direction would be a 'no brainer'. Therefore, it might be an interesting direction for disease segments where monitoring is easier.

In appendix X.X both the 'weighted criteria' and questionnaire results are presented in tables.

CHOSEN DIRECTION

The direction that will be further developed in the embodiment phase will be direction 1, become data donor. Although one direction is selected for further development, valuable and strong elements of others directions will be included as well. In addition, points of improvement are listed that will be used to further iterate the direction in the next phase.

Direction 1 – aspects to incorporate

- Apply to altruism, patients like this
- Provide information on how your data contributes

Direction 2 – aspects to incorporate

- Make data sharing with a game more trustworthy, a game does not really inspire trust.
- Incorporate educational aspect into it. This can increase patient's comprehension.
- Find a new name for this direction that makes it more appealing to patients

- Improve and iterate how the individual and collective value should look like and what triggers patients
- Find a balance in keeping the direction trustworthy and playful.

Direction 3 – aspects to incorporate

- Support can be helpful
- Peer pressure can help in living healthier/staying engaged

Direction 4 – aspects to incorporate

- Rewarding good behavior can be useful to keep up engagement and add value to the individual experience.

Direction 5 – aspects to incorporate

- Educating patients in how useful their data is, is a strong way to create awareness and make them more conscious.

E.3 DIRECTION REFINEMENT

The chosen direction, subsequent enhancements and useful elements do not provide enough context of the envisioned intervention yet. Therefore, before moving on to the embodiment phase, a clear description of what change the design intervention aims to pursuit will be presented.

The most desirable effect of the design intervention is that patients learn and understand how measuring and sharing health data contributes to their own health and that of others. As a result, patients' motivation and willingness to participate in their own health and health care in general should increase.

E.4 AIMED INTERVENTION

The aimed intervention will a combination of a health program and a digital platform that utilizes an app, telemonitoring devices, analytics, educational materials and feedback to gather patient generated health data. The program should assist patients who are diagnosed with CVD in finding the right balance in lifestyle and medication. The program should encourage patients to meet treatment goals by reporting on taking medication, verify monthly measurements and read or watch educational materials on CVD and health data. This should result in improved adherence of a healthy lifestyle and occasional measuring and sharing health data.

Personality of the design

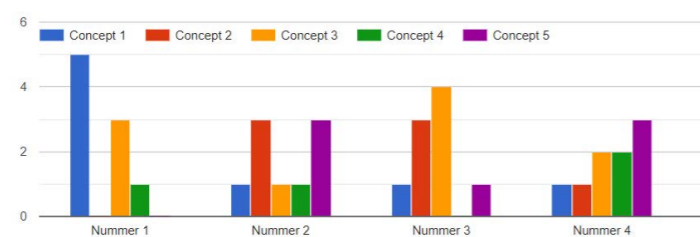
- Not intrusive or passive, but inviting
- Positive, but critical when necessary
- Personal not static

Capabilities of the design

- Increase knowledge
- Increased competence (understanding how to improve)
- Support progression
 - Giving purpose
 - Setting collective goals (finding the right balance in lifestyle & medication to improve health)
- Social interaction
 - Family (support or spouse as teammate)
 - Other patients/community (shared goals, how am I doing compared to others?)

Maak een top vijf van de getoonde concepten

Ranken van de concepten

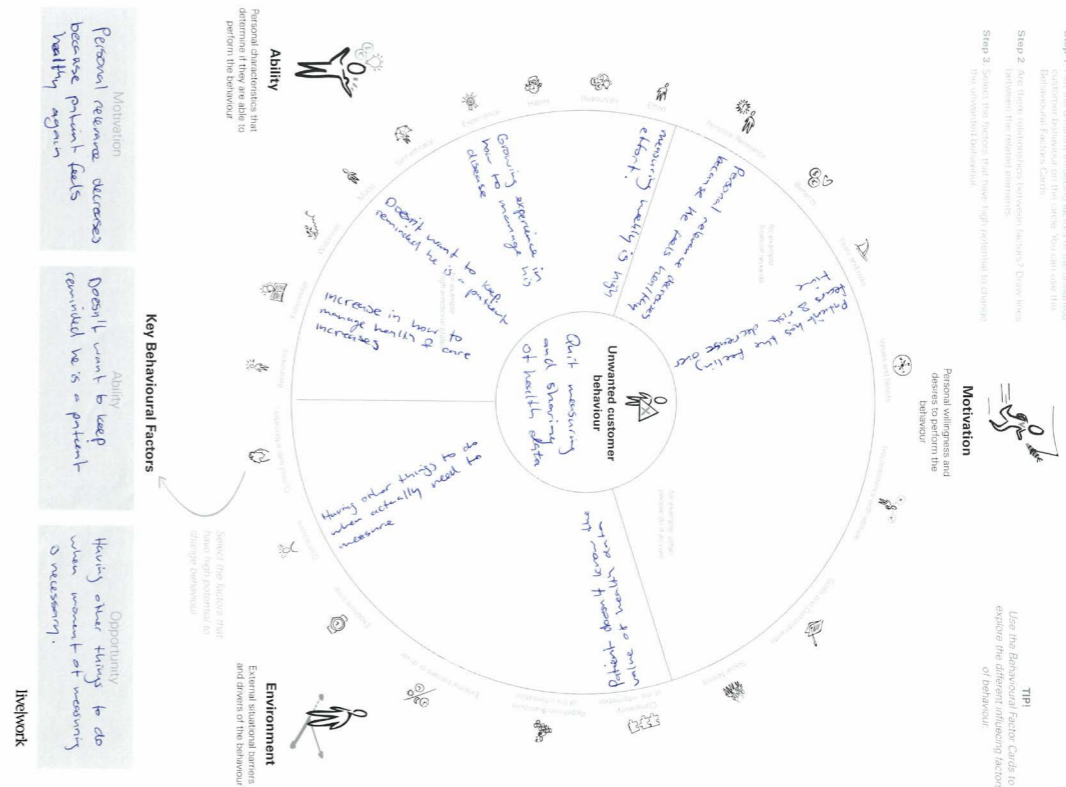


APPENDIX F - DESIGN REQUIREMENTS

		General	FHC - use case	[Chapter - title]		
1.0 User	Target group	The proposition should be organized around population segmentations		1.1 The proposition must target cardiovascular patients who are diagnosed with a chronic condition.	Chapter 1.1 - VBHC	
				1.2 The proposition must target cardiologists who provide care to CVD patients with a chronic condition	Chapter 1.1 - VBHC	
	Usability	CVD patients	To ensure positive participation in care, the proposition should adapt to the flued motives and needs during the care process of the patient		1.3 The proposition should adapt to the changing needs and drivers to measure and share health data of people who are diagnosed with CVD	Chapter 4.2 - User research
			The proposition should support the collective approach to improve care while at the same time provide individual added value		1.4 The proposition should show CVD patients how measuring and sharing their cardiac data can contribute to their own health	Chapter 4.2 - User research
					1.5 The proposition should show CVD patients how measuring and sharing their cardiac data can contribute to the health of others	Chapter 4.2 - User research
	Cardiologist	The proposition should provide doctors longitudinal insight in the wellbeing of their patients.		1.6 The proposition should provide cardiologists periodic data of their patients so they can better manage patient care	Chapter 1.1 - VBHC	
		The proposition should support doctors during decision making to provide more personalized treatment to patients		1.7 The proposition should support cardiologists during decision making to provide more personalized treatment to patients	Chapter 2.3 - Crowdsourcing care	
2.0 Vision	The proposition should be in line with FHC' vision and strategic goals		2.1 The proposition created for the CVD domain should be in line with FHC' vision and strategic goals	Chapter 4.1 - Use case		
	The proposition should increase patients' motivation and willingness to participate in care.		2.2 The proposition should increase the motivation and willingness of CVD patients to participate in improving cardiovascular care (increased adherence)	Chapter 1.1 - VBHC		
3.0 Data usage	Patient generated health data (PGHD) should be used to optimize clinical care and patient wellbeing		3.1 PGHD should be used to optimize CVD clinical care and research and patient wellbeing	Chapter 1.1 - VBHC		
	PGHD must be owned and controlled by patients themselves and given consciously and voluntary.		3.2 PGHD must be owned and controlled by CVD patients themselves and consent must be given consciously and voluntary.	Chapter 2.2 - Self-care		
	All eHealth initiatives of FHC should be compliant with health data regulations		3.3 The concept must be compliant with health data regulations	Chapter 2.2 - Self-care		
4.0 Business	The data that is tracked and gathered must lead to improved clinical care and reduce costs.		4.1 The data that is tracked and gathered must lead to improved clinical care for the CVD domain.	Chapter 2.3 - Crowdsourcing care		
	The proposition must be designed so FHC can show how they can support hospitals in the paradigm shift in health care		4.2 The proposition must be designed so FHC can show how they can support hospitals in improving CVD clinical care and research	Chapter 4.1 - Use case		
5.0 Organizational	The proposition should provide support across the health care continuum.		5.1 The proposition should provide support across the health care continuum of CVD patients	Chapter 1.1 - VBHC		

APPENDIX G - BEHAVIOURAL DESIGN TOOLKIT

Part 2.1 - Behavioural Factor Template



Part 1.1 - Behavioural Strategy Tool

Business objectives
What do you want to achieve?
→ improved clinical care in the region
→ more health data sharing between care providers
→ increase in data sharing from patients

Existing organizational challenges
Which current behaviours relate to the business problem? Try to think about it from the perspective of the stakeholders, departments or changes are part of this challenge?
→ not knowing what patients think of health data sharing
→ PCVD patients stop or decrease their measuring & sharing their health data
→ many different stakeholders
→ systems do not align

Customer segment
Go to tool 12 if you want to explore multiple customer segments
Unwanted customer behaviour
Which current behaviours relate to the business problem?
→ e.g. Employees continue to work via car and do not exercise enough
→ CVD patients stop measuring and sharing health data over time

Abstract goals or outcomes
What is the overall customer objective of this project?
→ e.g. We want people to be able to work, exercise more, live more healthy
→ We want patients to measure and share their health more often

Desired customer behaviour
Which alternative behaviours would be desirable?
→ e.g. Take the bike to work 3 times a week, exercise more, live more healthy
→ 10,000 steps every day
→ (Depending on which CVD) periodically measure & share health data

Target behaviour statement
Make sure you are focusing on behaviours and not emotions or outcomes. The statement should be specific, action based and measurable.
We want to influence CVD patients that stop measuring & sharing health data often & share periodically. This way, the hospital can improve both individual and collective care.

livelwork

Part 2.2 - Behavioural Journey Map

The service can be used to give and monitor steps in sustainability and research.
 Step 1: Fill in the different elements per stage for the current unwanted behaviour.
 Step 2: Brainstorm on possible future scenarios.
 Step 3: Select the key moments in the journey map that have a high potential for an intervention.

	Before	During	After	
Activities	Live life like you always did	Get diagnosed with a CVD During visit GP or cardiologist Go online check into TM service Decide on useful or not	Receive TM devices during consult & via post Ask questions Look up info Try device platform	Tutorials how to use the TM and service use TM devices & service which (desired outcome) video call consult online platform use TM devices & service which (desired outcome) adjust lifestyle/devices check health spontaneously See if it is stable
Touchpoints				
Current customer behaviour				
Current mindset				
Behavioural factors				
Future customer behaviour				
Desired mindset				
Hotspots and Painpoints				

Handwritten notes and annotations:
 - **Before:** "Not interested in health", "Not motivated".
 - **During:** "Worried about diagnosis", "Need advice/support", "Wants to manage healthy again", "No awareness of health data", "No cheeriness to reduce health data", "High personal relevance", "Low personal relevance", "Doesn't want to be committed to anything", "Have other things to worry about", "Are worried".
 - **After:** "Less use of TM service", "TM service is not used anymore", "Years list with cardiologist", "No meaning/sharing", "Wait for yearly consult", "Periodically measure & share data", "Create personal notice to periodically measure & share data".
 - **Hotspots and Painpoints:** "Make TM devices/service a personal coach (digital partner at core team)", "Increase awareness of health data and individual contributions", "Re position their role from patient to coach".

livelwork

Part 1.2 - Customer Segment Template

Customer segment
Name this segment at the end of the exercise.
Patients who are using a telemonitoring service to manage their CVD

Unwanted customer behaviour
Which current behaviours relate to the business problem? Try to think about it from the perspective of the stakeholders, departments or changes are part of this challenge?
→ e.g. Employees continue to work via car and do not exercise enough
→ Patients' adherence to measure & share health data over time
→ Patients who are using a telemonitoring service to manage their CVD

Abstract goals or outcomes
What is the overall customer objective of this project?
→ e.g. We want people to be able to work, exercise more, live more healthy
→ We want people to measure and share their health data more

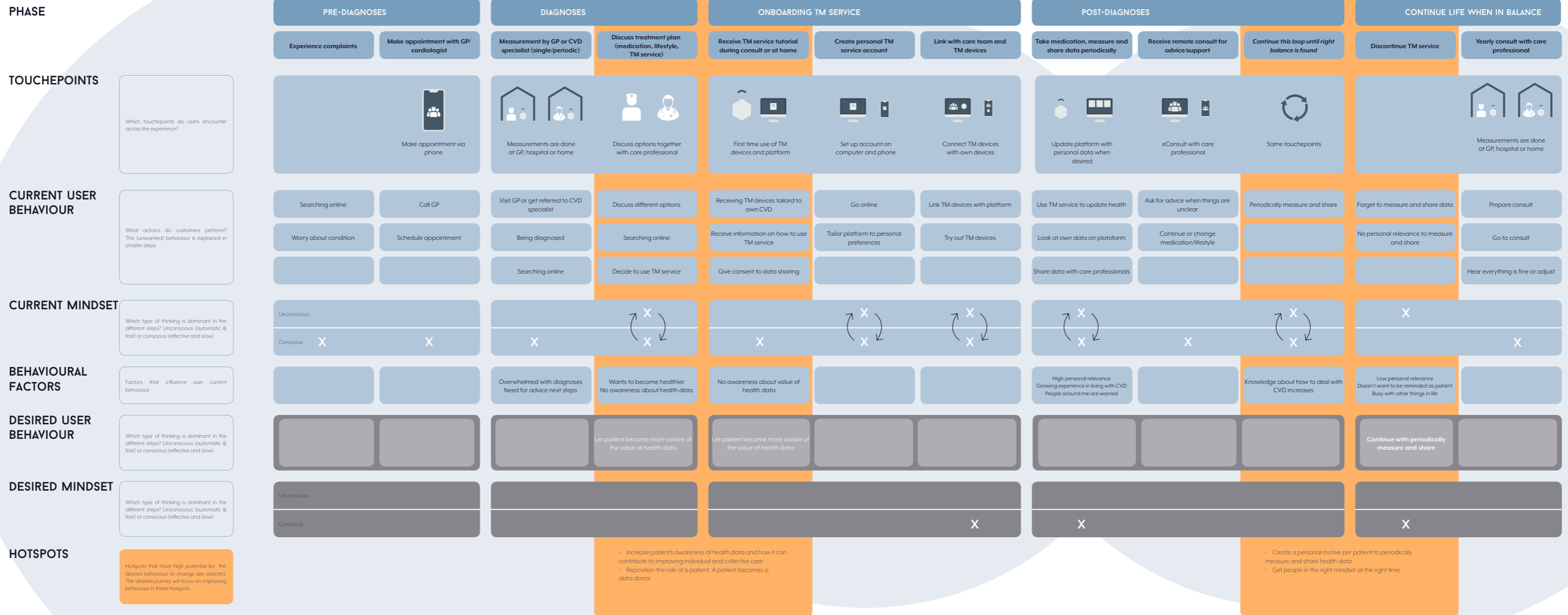
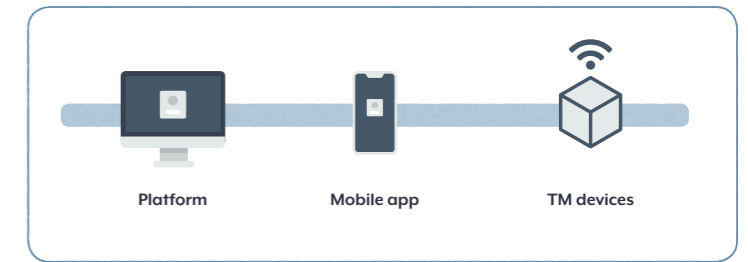
Desired customer behaviour
Which alternative behaviours would be desirable? Make sure you are focusing on behaviours and not emotions or outcomes. It should be specific and action based.
→ e.g. Take the bike to work 3 times a week, exercise more, live more healthy
→ 10,000 steps every day
→ We want people to periodically measure and share their health data
→ depends on the type and phase of CVD how often measuring and sharing is necessary

When does the behaviour occur? Think about contexts and outcomes.
At their home where they should wear their watch.

When are they performing this behaviour?
In their daily routine.

livelwork

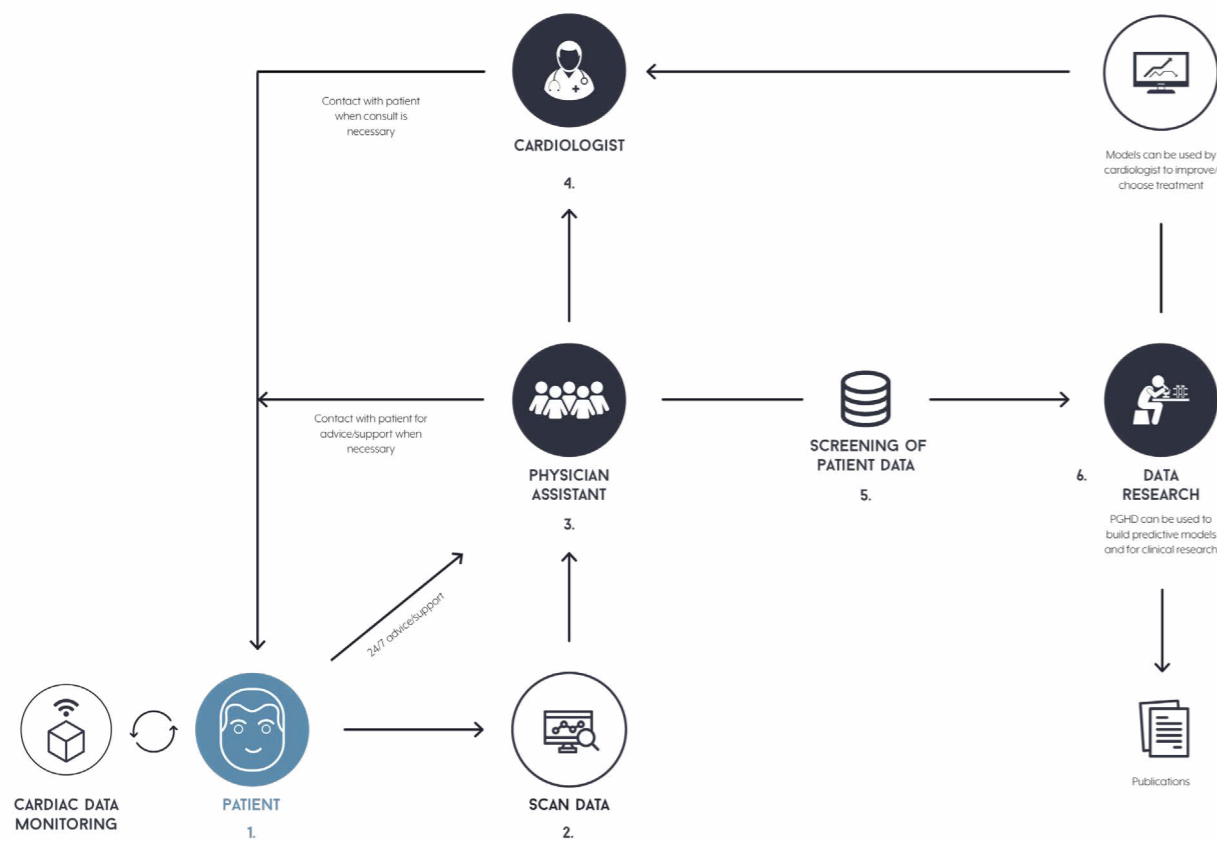
APPENDIX H - CURRENT TM JOURNEY



APPENDIX I - FINAL INTERACTION FLOW MODEL

The interaction flow model is revised after user research. Cardiologists suggested to let physician assistants play a important role in the TM service.

A visual element for the decision support tool is added to show that the tool is used on the cardiologist's computer.



APPENDIX J - FINAL VALUE FLOW MODEL

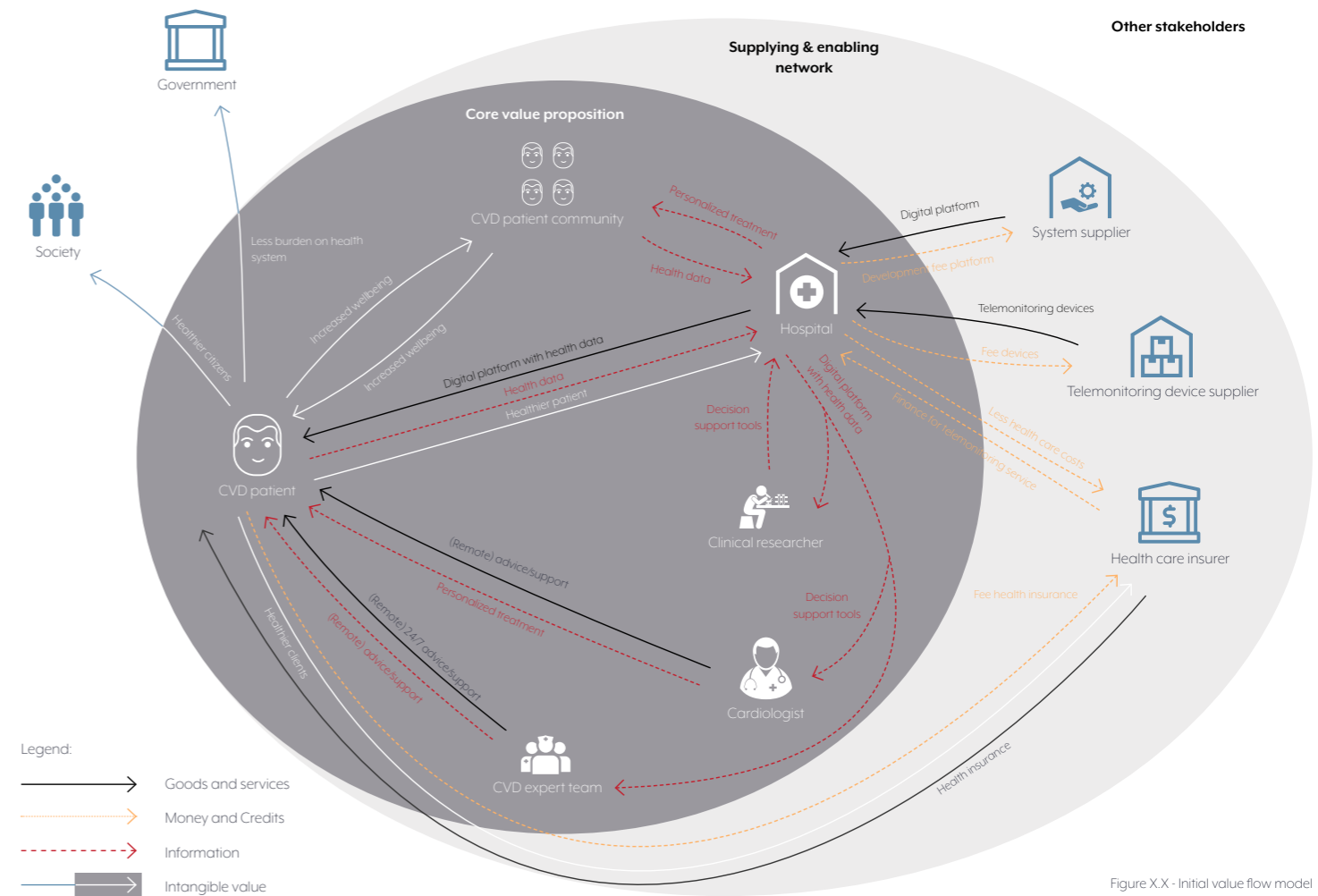



Figure X.X - Initial value flow model

APPENDIX K – ADDITIONAL PERSONA

As discussed in chapter 4.2.4, the results of the morphology psychology analysis can be used to create need based personas. These



Sharing health data helps me to reassure people around me

A year ago, Annemieke (64) was diagnosed with arrhythmia. For the cardiologists to be able to provide the best care, Annemieke is advised to measure and share her heart rate and weight once every week

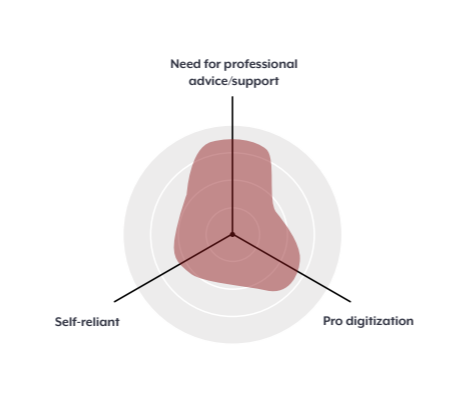
After a year of rehabilitation Annemieke still prefers to have the opportunity to receive advice when she feels anxious about her condition. Measuring and sharing her heart rate and weight helped her and her cardiologist to find the right doses of beta blocker faster. She became a data donor after she experienced the personal benefits of sharing health data.

NEEDS

- Professional advice about what she can and cannot do physically
- Professional advice about her medication and life style
- Easy way to check and verify her health when she feels anxious
- Wants to reassure her family
- Wants to give something back because she received such good care

PAINS

- Often forgets to measure and share health data
- She has to get used to all the digital touchpoints and devices when measuring and sharing her heart rate and weight.
- Feels anxious and nervous when she experiences an infrequent heart beat
- Annemieke's family is often worried about her health, she doesn't want them to be unnecessarily worried



MOTIVES TO DONATE DATA
I donate data because...

- ... for a personal medical health check for personal assurance **4**
- ... for a personal medical health check to reassure family and friends around me **4**
- ... to help my doctor in providing better care **5**
- ... to help other cardiovascular patients **5**
- ... because people around me do it as well **2**

APPENDIX L – PROPOSITION POSTER REQUIREMENTS

Proposition requirements (by Hessel Bouma FHC)

- Clearly communicate how different stakeholders benefit from the proposition and what kind of value it offers to them (patient, cardiologists, hospital).
- How is the proposition financed and by who?
- Clearly show the needs from the patient perspective and the problems you solve for them.
- The proposition should show how it can have impact on the capacity of care. Does it really result in higher care efficiency?
- The concept should be accessible for care providers and patients. This means that it should be easy to implement in their daily routine and not result in more work.
- How does it impact the current capacity?

APPENDIX M – DESIGN REQUIREMENTS ASSESSMENT

The concept is evaluated on the design requirements that are shared in appendix X.x

USER REQUIREMENTS

Target group

- 1.1 The proposition must target cardiovascular patients who are diagnosed with a chronic condition.
- 1.2 The proposition must target cardiologists who provide care to CVD patients with a chronic condition

The concept is organized around a population segmentation like proposed by the Value Based Health Care concept. This allows for more specific tracking of health outcomes of cardiovascular patients and can result in segmentation specific interventions. However, it should be noted that there are many types of cardiovascular diseases and each needs its own way of treatment and tracking health outcomes. Therefore, the concept should be tailored even more specifically.

Usability

- 1.3 The proposition should adapt to the changing needs and drivers to measure and share health data of people who are diagnosed with CVD.

The concept adapts to patients' fluid needs and drivers to maintain treatment (measuring and sharing of health data) adherence by appealing to different patient drivers. The drivers found during user research can be used but the effectiveness of using these drivers should be researched.

- 1.4 The proposition should show CVD patients how measuring and sharing their cardiac data can contribute to their own health
- 1.5 The proposition should show CVD patients how measuring and sharing their cardiac data can contribute to the health of others

The concept enables patients to track the impact of their data donations on their own care and how it contributes to research and care of fellow patients. Some examples

are provided in the concept on how the patient could experience this.

- 1.6 The proposition should provide cardiologists periodic data of their patients so they can better manage patient care
- 1.7 The proposition should support cardiologists during decision making to provide more personalized treatment to patients

The final concept makes sure the patient periodically measures and shares his health data. This data can be used by the cardiologist to track patient's health and could use it to compare someone's data with a big data database. This way, the cardiologists is supported during decision moments and can use this information to provide more tailored care to his patient.

VISION REQUIREMENTS

- 2.1 The proposition created for the CVD domain should be in line with FHC' vision and strategic goals

Several strategic goals and values of Frisian Health Campus are shared in chapter 4.1. The evaluation session with FHC showed that the concept is in line with several of their strategic goals and values. The concept is meant to be patient-centered because it allows patients to have more control over their own data and enables them to participate to improve their own and collective care. FHC acts as a facilitator for care innovation and with DataDonor they have to bring together several parties to let this concept work. The concept did not look into how it could strengthen the economic structure for health care in Friesland.

- 2.2 The proposition should increase the motivation and willingness of CVD patients to participate in improving cardiovascular care (increased adherence).

User research showed that patients are open to help improve clinical care but that the threshold to take part is often too high (i.e. investing time and effort). The concept makes it easier for patients to participate

in improving health care. This way the concept tries to increase patient's motivation and willingness to improve care.

DATA USAGE REQUIREMENTS

- 3.1 PGHD should be used to optimize CVD clinical care and research and patient wellbeing
- 3.2 PGHD must be owned and controlled by CVD patients themselves and given consciously and voluntarily.

The concept uses Patient Generated Health Data for predictive analytics to improve clinical care and for better care management. The concept therefor contributes to optimize clinical care, research and patient wellbeing. The concept takes the GDPR law into account and makes sure patients are made aware of how their data is used and lets them give consent consciously and voluntarily.

BUSINESS REQUIREMENTS

- 4.1 The data that is tracked and gathered must lead to improved clinical care for the CVD domain.

The concept envisions a way of strategically obtaining patient health data. FHC can use to data for research and could attract third parties that can help with building predictive models to improve clinical care.

- 4.2 The proposition must be designed so FHC can show how they can support hospitals in improving CVD clinical care and research

The design is presented on a proposition poster that introduces the concept and communicates the problem that is being solved, how it works, the targeted users and added value for important stakeholders. This proposition is iterated on and will be used to show how FHC could facilitate and support hospitals in eHealth solutions.

ORGANIZATIONAL REQUIREMENTS

- 5.1 The proposition should provide support across the health care continuum of CVD patients.

The concept can be used for prevention, diagnosis, treatment and home care of the health care continuum shared by Philips. The concept is meant for patients who are diagnosed with CVD and does not focus on healthy living. The supporting technology could be used in the future to predict what healthy living is best for prevention of developing CVD risk.

APPENDIX N – POSTER ITERATIONS

POSTER ITERATION - FHC

- Show that the concept is compliant to health data regulations
- Share research results showing that patients are fine with sharing their health data and that they like to contribute to improve clinical care. This is not on the poster which could result in your audience asking questions about this.
- It is not clear that 'the problems we are solving' are based on actual interviews with patients and cardiologists
- Communicate that data that is being shared/used is anonymized and privacy is taken into account
- Add 'patient' and 'cardiologist' to the pictures you show.
- Value for the hospital is also saving costs because there are less readmissions and the hospital needs to do less costly diagnoses because with this diagnosis can be done more accurately.
- Show what the value is for society healthier people
- Add DataDonor underneath the logo so it is clear that is the name of the platform

POSTER ITERATION - DELOITTE CONSULTANTS

- Change the title to 'donate your data to improve the care you receive' not 'receive the care you deserve'. Otherwise people might think 'so I won't receive the care I deserve if I don't share my data?'
- Show how your proposition is connected to portals or a pgo.
- Remove less rehospitalization. This is not a direct result of your proposition but more of the telemonitoring service where it is added on.
- Add an extra stakeholder to the value part. Show what implications are for research (better understanding of disease)
- Be very clear in compliance, this is top of mind by the people you are going to show this proposition.
- If patients are an important contributor to the system you might look at adding the 'Patients Included' label.

Figure x.x - First version proposition poster

Donate your health data to receive the care you deserve, and do good at the same time.

With Data Donor we help you to enhance health data sharing to improve clinical care for cardiovascular patients.

THE PROBLEM WE ARE SOLVING

Opportunities to provide more personalized care to cardiovascular patients is increasing due to technological developments. Health data is essential to build predictive models which care professionals can use to provide more personalized care. However, the hurdles shared on the right remain patients from periodically monitor and share their health data.

- Patients **desire to monitor health** fades because a balance in medication and lifestyle is found
- Patients are **unaware of the value** of their health data
- Patients **don't want to be reminded** they are a patient

HOW IT WORKS

Plug-in platform
The data donor platform is a plug-in application that can be added to existing telemonitoring services. This way, donating data for research becomes more accessible.

Personalized treatment adherence
To maintain monitoring adherence, patients are triggered by personalized drivers to measure and share their health data.

Decision support tool
Care professionals can use the data donor platform as a smart decision support tool. The tool uses predictive analytics to provide tailored advice on treatments.

Value of health data
To make patients more aware of the value of their health data, the platform provides information and stories of the impact health data can have on patients own care and that of others.

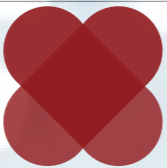
FOR WHO ARE WE DOING THIS

- "Make it easy for me to return a favor after all the good care I received"*
- "Help me to find the right (doses) medication after I am diagnosed"*
- "Peace of mind that I can provide tailored care to my patients"*

ADDED VALUE

- Patients:** More personalized care, Adding value to society
- Cardiologists:** Provide tailored treatment, Better grip on care process
- Hospital:** Healthier patients, Increase in data research

Figure x.x - Second version proposition poster




DataDonor

Donate your health data
to receive the care you deserve,
and do good at the same time.


DataDonor is a module that can be added to existing telemonitoring services
and makes it easier to donate your health data for research.

THE PROBLEM WE ARE SOLVING


Opportunities to provide more personalized care to cardiovascular patients is increasing due to technological developments. (Telemonitoring) health data is essential to build predictive models which care professionals can use to provide more personalized care. Research shows that **patients are willing to share health data and like to contribute to research**. However, the hurdles shared on the right remain patients from periodically monitor and share their health data.



Patients' **desire to monitor health fades** because a balance in medication and lifestyle is found



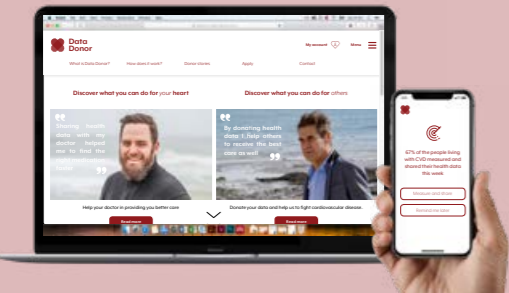
Patients are **unaware of the value** of their health data



Patients **don't want to be reminded** they are a patient

Generative interviews (1.5h) with 7 cardiovascular patients were conducted for this research.

HOW IT WORKS




Module
The data donor platform is a module application that can be added to existing telemonitoring services. This way, donating data for research becomes more accessible.

Decision support tool
Care professionals can use the data donor platform as a smart decision support tool. The tool uses predictive analytics to provide tailored advice on treatments.


Personalized treatment adherence
To maintain monitoring adherence, patients are triggered by personalized drivers to measure and share their health data.

Value of health data
To make patients more aware of the value of their health data, the platform provides information and stories of the impact health data can have on patients own care and that of others.


FOR WHO ARE WE DOING THIS



Patient: "Make it easy for me to return a favor after all the good care I received"



Patient: "Help me to find the right (doses) medication after I am diagnosed"



Cardiologist: "Peace of mind that I can provide tailored care to my patients"

ADDED VALUE

Patients

- More personalized care
- Adding value to society

Cardiologists

- Provide tailored treatment
- Better grip on care process

Hospital

- More accurate diagnoses
- Increase in data research
- Less rehospitalization

