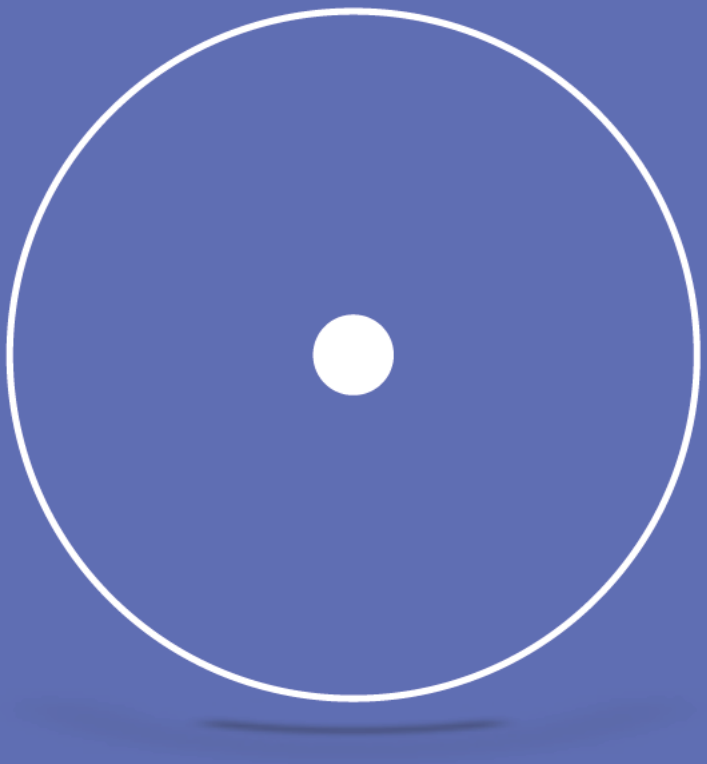
The consultation of the future

A tool to make the communication between patients and specialists more emphatic in the digital world of 2030



Appendices

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September 2019

Appendices Master Graduation project
The consultation of the future: A tool to make the communication between patients and specialists more emphatic in the digital world of 2030

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September 2019

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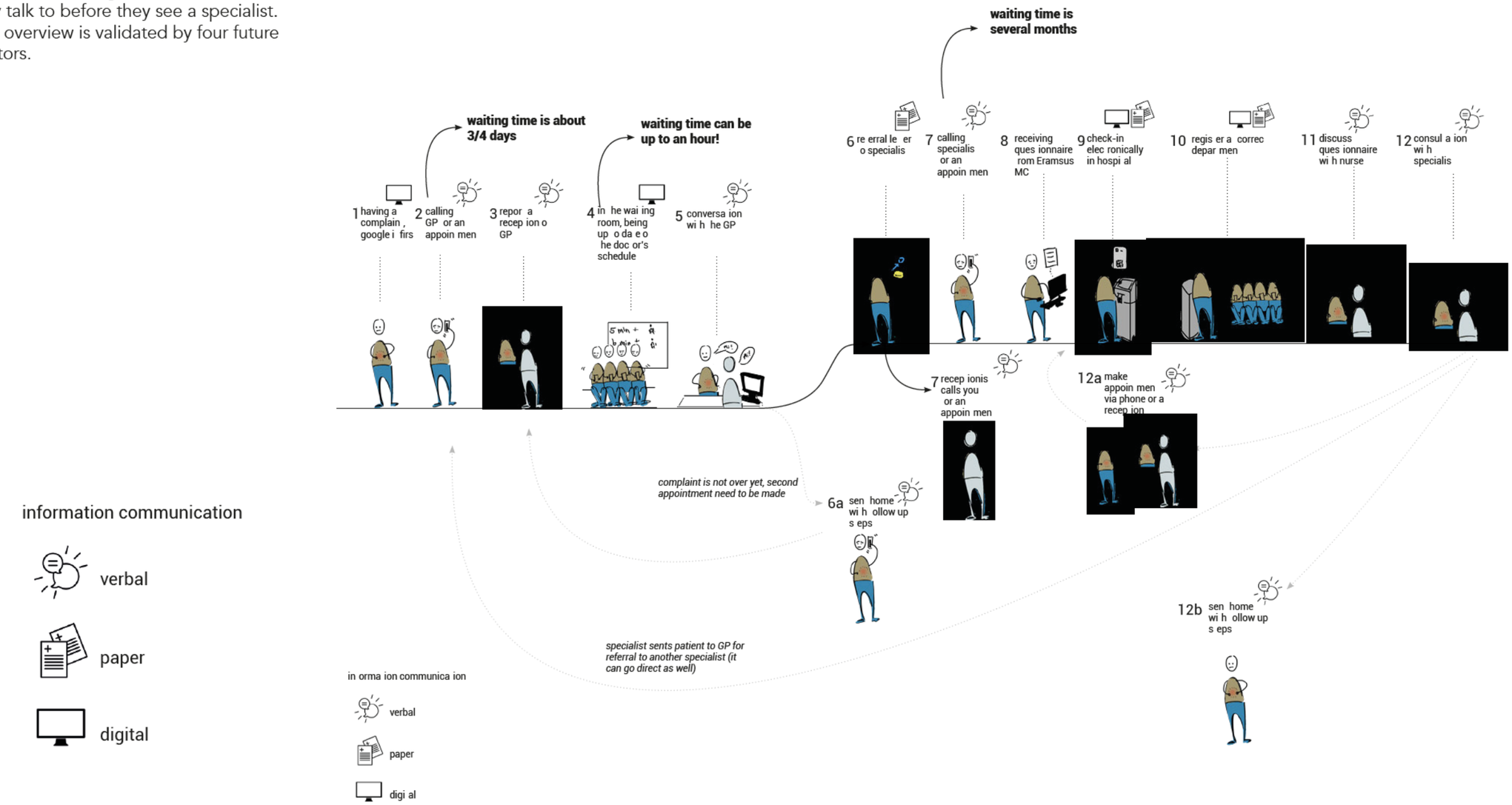
CONTENT

A: Current health path

The current health path is not continuous and smooth. In figure 1 is shown how the current health path of a patient looks. It shows how the patient interacts, how long it takes, and whom they talk to before they see a specialist. This overview is validated by four future doctors.



information communication

verbal

paper

digital

Figure 1: the continuum of care

B: User study

The goal of the user study is to unravel the current interaction between patents and specialists. Furthermore, the conflicting and matching concerns should be found to improve the patient experience before, during and after the consultation. This chapter describes the test set-up and the results.

B.1 Test set-up

An extensive user study is conducted to identify (1) the current interaction and the implementation of shared decision making within the Erasmus MC and (2) the conflicting and matching values of doctors and patients before, during and after the consultation. The goal is: *to formulate touchpoints of experience for both the patient and the doctor, that can be improved or preserved to improve the patient experience for the future.*

1. Research questions

The following research questions are aimed to be answered:

1. Interaction: how is the communication between the doctor and the patient?
   - 1.1 How is the current interaction between doctors and patients?
   - 1.2 Which and how is the information communicated?
   - 1.3 How is the information exchange being influenced?
   - 1.4 How do patient and doctor see their relationship?
2. Perception: how is the consultation perceived (experiences, values and beliefs) by the doctor and the patient?
   - 2.1 How do doctors and patients experience consultation?
   - 2.2. What are their conflicting or matching concerns?

2. Participants

To create a holistic patient experience along the whole traject, the health traject is seen from the patient's perspective. This means that the health traject starts at the point of their complaint. Focussing on the beginning of the health traject is important because:

- The patient experience starts at the moment the patient has their complaint and not when the patient enters the Erasmus MC.
- The conversation about the patients values, preferences and needs preferably takes place early in the health process of the patient. Unfortunately the Erasmus MC is not possible to do that right now, so there is an interesting shift between the healthcare providers and the Erasmus MC.
- Different patients have different needs, therefore the primary care has a 'one size fits all' approach, but this isn't valued positive by patients and doctors (Porter, Pabo, & Lee, 2013).

The consultations at the general practitioner and the internal medicine are a perfect match for this focus, since both consultations are at the beginning of the health traject and have broad and holistic approach. Mostly it is not known what the diagnosis of the patient is, which makes the needs of the patients vague and unclear.

3. Approach & method

The Experience-Based-Co-Design method is used as an inspirational guide (Bate & Robert, 2006) to find the touchpoints of experience. Within this method, patients and doctors get the opportunity to co-design the future experience. Different techniques are combined to design this 'experience': observations, interviews and generative sessions. This combination gives a deeper understanding of the latent and tacit knowledge of a person (Visser, Stappers, van der Lugt, & Sanders, 2005). This knowledge is the key to a experience:

"EBCD involves gathering experiences from patients and staff through in-depth interviewing, observations and group discussions, identifying key 'touchpoints' (emotionally significant points) and assigning positive or negative feelings."
- What is Experience-based co-design? 2017

Those experience touchpoints are aimed to be found by answering the research questions with the following studies:
Observations (RQ 1.1, 1.2, 1.3, R.Q 2.1, 2.2)
In-depth interviews (RQ 2.1, 2.2)
Creative session (RQ 2.1, 2.2)

In total, 13 consultations are observed spread over four doctors, of which two general practitioners and two specialists. All four doctors are interviewed after the observed consultations. Due to the hospital regulations, it was not possible to question the patients, and therefore, four patients out of my network are interviewed. They all recently had an appointment at the G.P. To get a brief understanding on how they experienced the last appointment they are asked to keep a 'what I feel'- booklet before, during and after their consultation. In this way, eight different consults are evaluated in the interviews.

4. In-depth interviews

The emotion-driven approach of Pieter Desmet is used to determine the matching and conflicting concerns of patient and doctor. According to Pieter Desmet, events or products can make you feel good when they fulfil your needs and wants. This fulfilment means that a positive experience can be created when your needs and wants of that moment are being addressed.

Pieter Desmet has identified 13 fundamental needs which are universal for all people. The way how people fulfil these universal needs is different, and this explains why different people have different emotions towards the same stimulus events: they have various concerns (Meiselman, 2016).

By using a stimulus event and emotion as a starting point within the interview, the deeper laying concerns within a certain situation can be unravelled (figure 3). After having the results of the eight interviews, the results are evaluated and validated with four future doctors. Lastly, the results are sent back to all the participants to ask for feedback and validation.

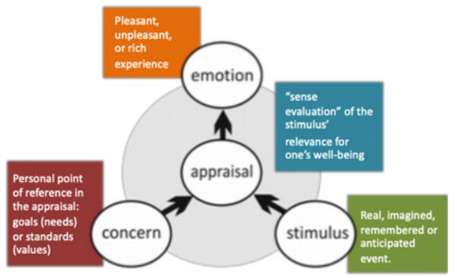


Figure 3: the basic model of product emotion (Desmet, 2002)

B.2 'What I feel' - booklet

Bes e deelnemer,

Dank u wel da u wil deelnemen aan mijn onderzoek over de spreekkamer van de oekoms .

He hoo ddoel van mijn onderzoek is om uw ervaring ijdens he consul bij de huisar s o in he ziekenhuis in kaar e brengen. Wa vond u belangrijk ijdens di gesprek en waarom?

Di boekje is een voorbereiding op he in erview (+-45 minu en) da binnenkor gaa plaa svinden. De opdrach en zijn verdeeld in drie ca egorieen:
1. Wa vind ik belangrijk ijdens een gesprek me een dok er?
2. Wa is mijn laa s e ervaring ijdens een gesprek me een dok er?
3. Hoe zie mijn ideale gesprek erui ?

He zijn kleine opdrach en die een s ar pun vormen voor he in erview. Ik zou he daarom pre ig vinden als u he boekje kan invullen voorda we me elkaar gaan pra en. On houd da er geen goed o ou an woord mogelijk is. Alle inzich en die u me kan geven zijn waardevol.

Hee u nog vragen o is ie s onduidelijk, dan kan u al ijd bij me erech door me e mailen o e bellen.

Groe jes,

Hanneke van der Velden

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TUDelft

DIT BEN IK

di vind ik leuk om e doen:.....

di doe ik allemaal op mijn compu er :.....

omoirkel de activiteiten die van toepassing zijn Je mag activiteiten aanvullen als ze er niet tussenstaan

openingstijden opzoeken voordat je naar de winkel gaat
het nieuws lezen
zakelijke afspraken maken
kleding kopen
belasting zaken
sociale afspraken maken
boodschappen

muziek luisteren
~~entertainment zoals~~ **films**

mijn naam:.....

DEEL 1 - voordat ik naar de dokter ga

De eerste opdracht! Vul de zinnen (zo uitgebreid mogelijk) aan.

> Gezond zijn be eken voor mij:.....

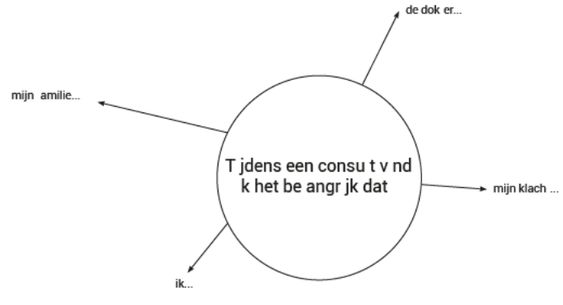
> k ga naar de dok er als....

maar gebruik he in erne als.....

> Als ik een a spraak maak, dan verwach ik van de dok er:.....

DEEL 1 - als ik bij de dokter ben

Vul het woordenweb aan! Je mag zelf ook categorieen toevoegen die voor jouw belangrijk zijn.



DEEL 1 - als ik terug kom van de dokter

Vul jouw antwoorden in in de cirkels en op de lijnen.

ben ik evreden als..

op deze manier laat ik mijn tevreden gevoel merken:

ben ik on evreden als..

dit doe ik om mijn ontevreden gevoel weg te nemen:

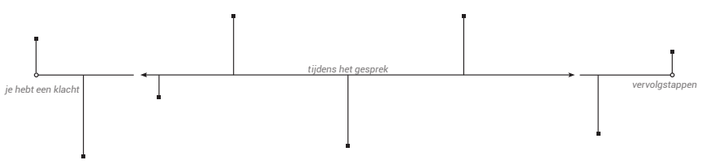
Graag zou ik de in orma ie ui he consul nogmaals erugzien... zoja, hoe?

DEEL 2 - jouw ervaring tijdens je laatste gesprek

Op deze pagina heb jij ruimte om aan te geven wat er is gebeurd en hoe je het hebt ervaren. Als er niet genoeg lijntjes op de tijdlijn zijn aangegeven, mag je deze zelf bijtekenen!

> He laa s e gesprek me mijn ar s heb ik ervaren als:.....

> Wa is er allemaal gebeurd, voor, ijdens en na he gesprek me mijn ar s? Vul de ijdlijn in me de gebeur enissen en voeg smilies oe --->



DEEL 3 - dit is hoe ik het zou willen

Maak het verhaal van jouw ideale consult af!

Titel: mijn ideale consult

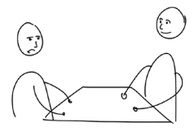
1

2

3

4

5



jouw ervaring met het gesprek bij de huisarts of in het ziekenhuis

TU Delft

Erasmus MC
University Medical Center Rotterdam
Ezafung

B.3 Communication flow model

This figure describes the result of the research question 1. It shows the current communication flow between patients and specialists. The numbers indicate the order of the conversation; the left side is the information from the perspective of the patient and the right from the specialist.

Three key elements influence the information exchange: the 'communication' type, the complaint and the perception of the doctor.

The observations distinguished three communication types:

- The denier: people who pretend that everything is going well. They do not seem to understand how serious their complaints are. They deny the severity of the complaint and the depth of their communication is therefore minimal.
- The smart-ass: people who bring all the information they have to the consultation. They are very much up-to-date about their health path and complaints.
- The language barrier: people who do not speak the language and bring someone along who can translate the consultation for them. They are not able to communicate directly with their specialist.

The observation distinguished two types of complaints:

- People who have a clear goal (getting medicine or being put through to a specialist)
- People who are seeking for comfort and emotional support around their physical complaint.

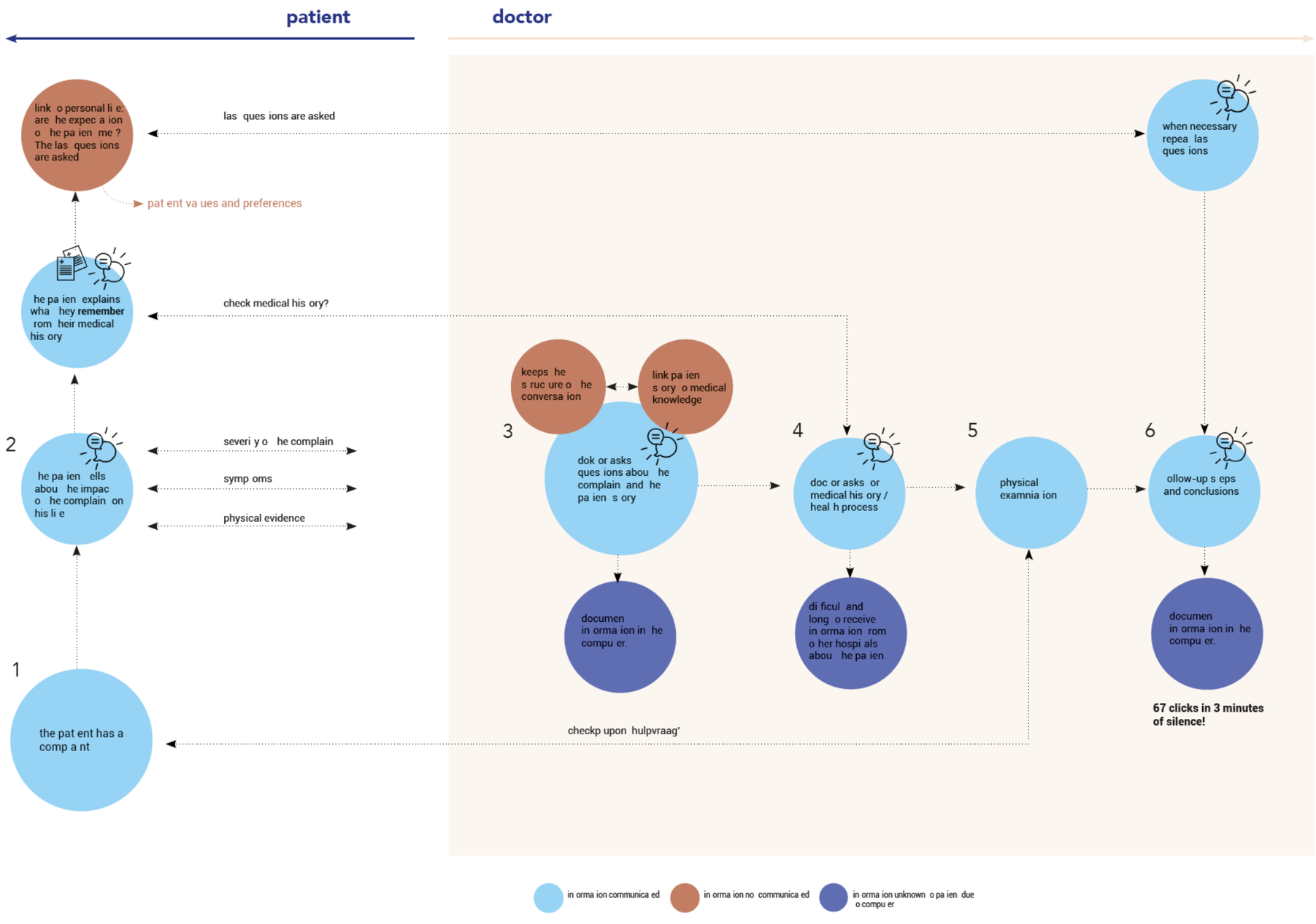


Figure 4: the communication flow model

B.4 Clusters

To answer the second research question: *how is the consultation perceived (experiences, values and beliefs) by the doctor and the patient?* quotes from the in-depth interview are clustered. The quotes are clustered into groups after which one concern is linked to the group. An example of how the quotes are clustered:

Quote 1: 'It does not give me trust when a specialists just ticks the boxes. I want to be helped personally.'

Quote 2: 'My doctor made notes on paper. I find this a way to express her effort. She makes an effort for me.'

Concern: I want to have personalized care, with attention

Fundamental need: need for attention, acknowledgement. Quote 1 and 2 are clustered within the same concern. Finally, the established concerns are mapped on a timeline for specialists and doctors. The result can be found in Appendix B.5.

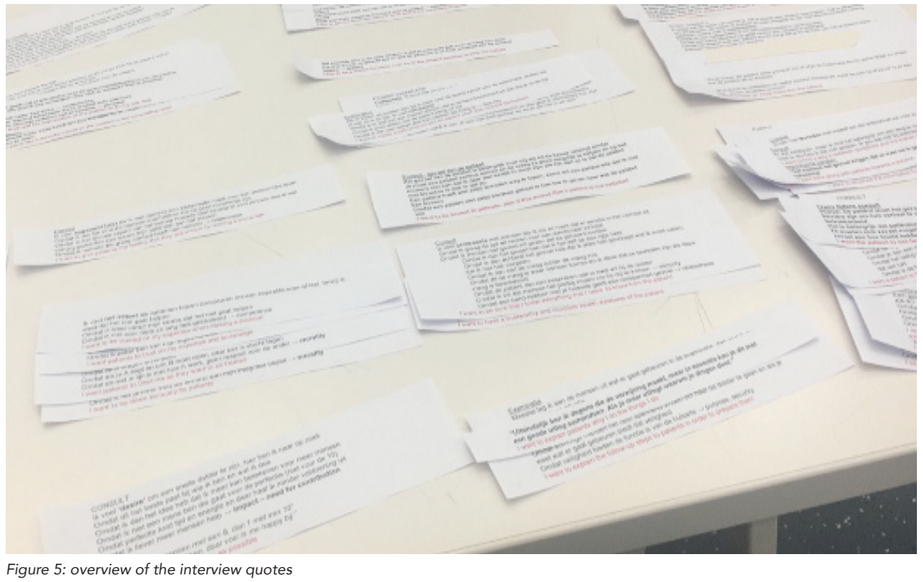


Figure 5: overview of the interview quotes

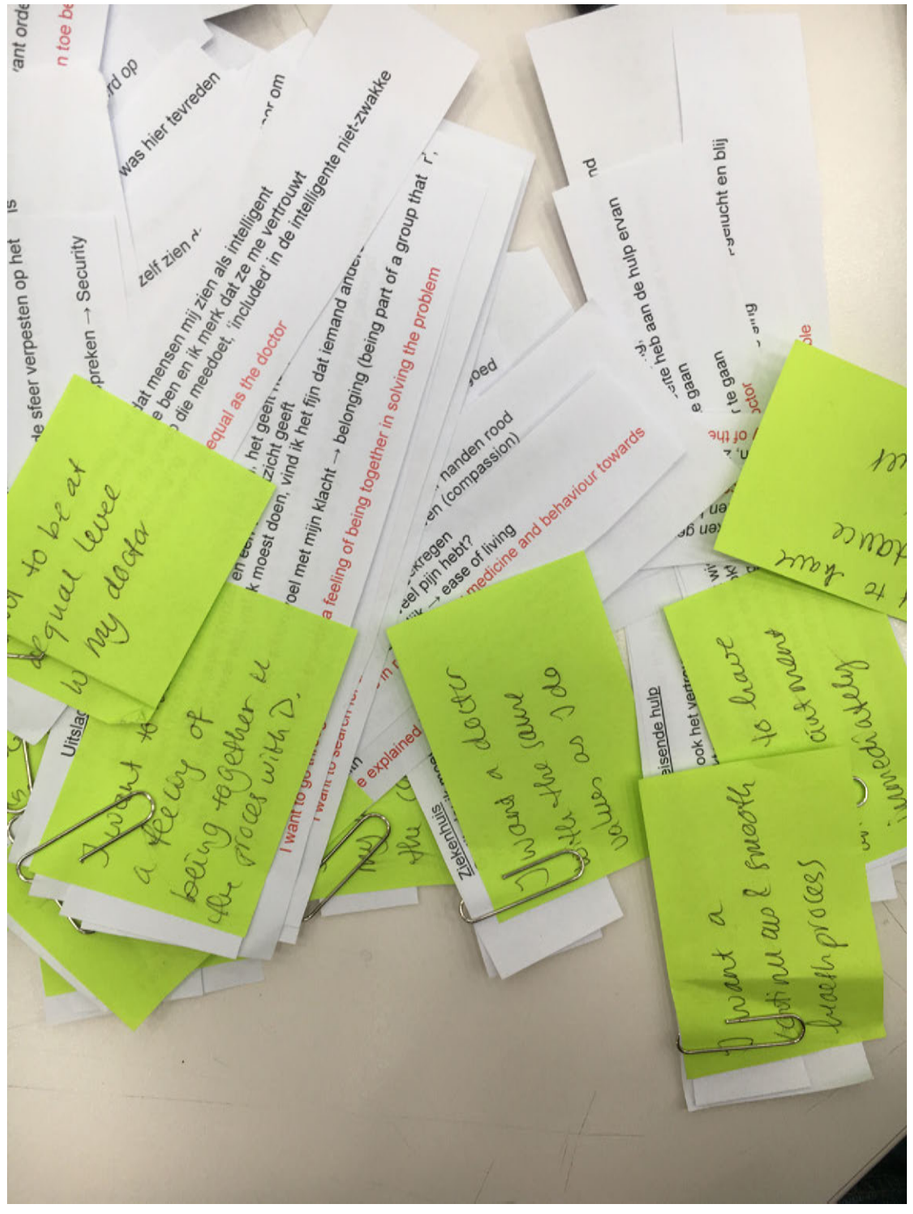


Figure 6: overview of the clusters per concern

B.5 The experience timeline

The experience timeline represents the different emotions, actions and concerns of the patients and specialists. The concerns are found after clustering the quotes from the interviews.

Patients

Patients strive for relatedness, acknowledgement and order (fundamental needs). They want their complaints to be acknowledged by doctors and other patients, in order to feel comfortable visiting the doctor. Being seen as 'a strong person which does not complain' is the main driver. Secondly, they want to be treated personally. This means that they strive for a medical and social basis, where they feel important when the doctor gives them personal attention. As a result of those needs, patients want to have access to the doctor on demand, like a child that relies on the support of their mother. Right now, the patients experience the end of the consultation negatively, because they feel being alone in the health process after the consultation.

"The doctor must know exactly what is the matter with me in order to help me the best"

" You feel accepted if says: hey it's okay that you don't feel well!"
nce

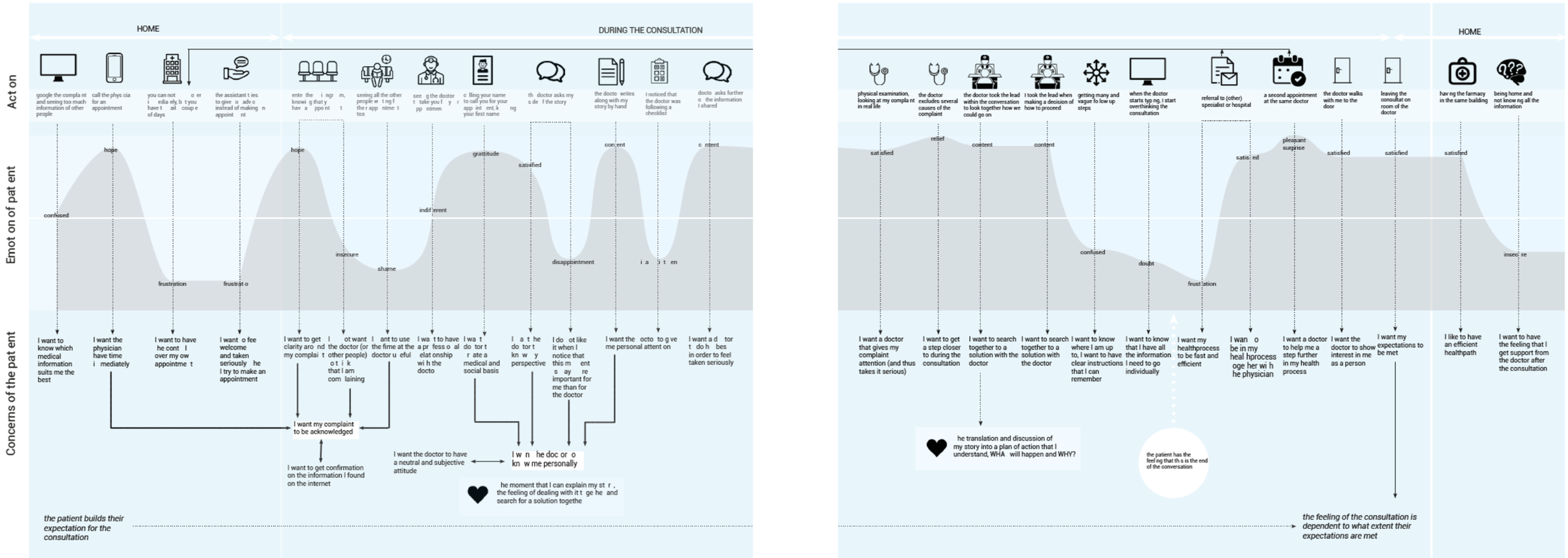
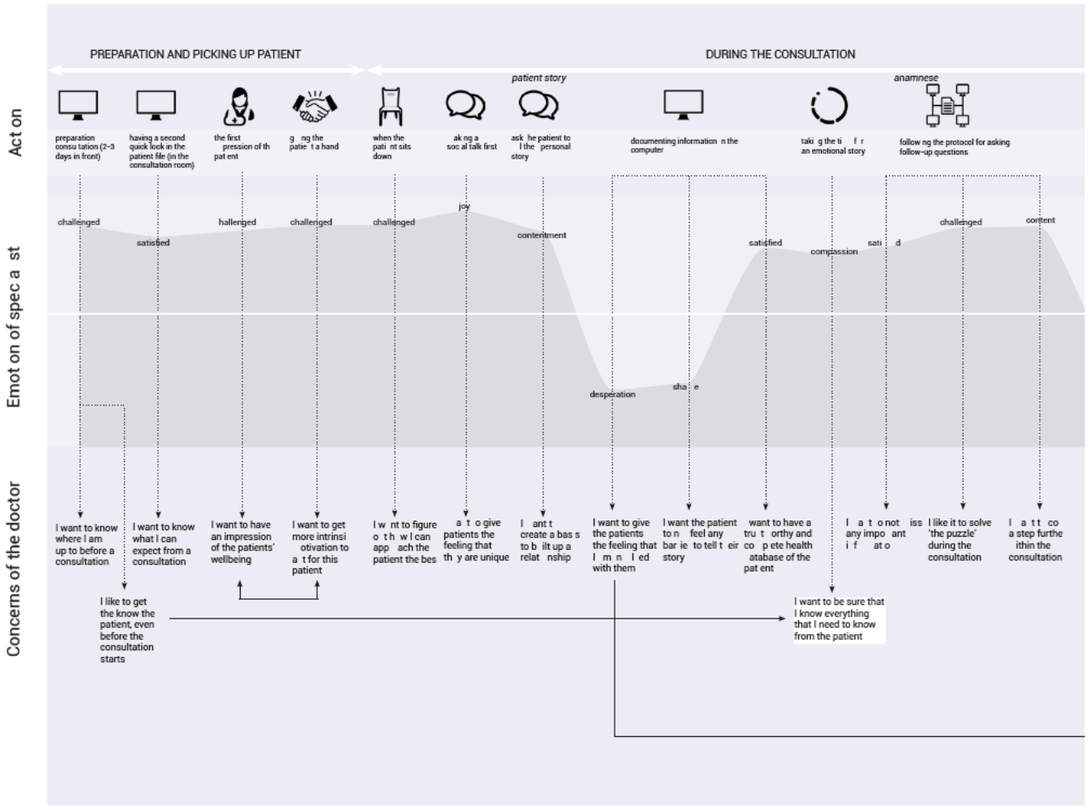


Figure 5: patient experience timeline

Specialists
Doctors also strive for relatedness, order and acknowledgement. They want to create an intimate and safe environment to comfort the patient, but this is not always possible due to the computer which makes them feel ashamed and desperate. They want to have their full concentration for the patient in order to help them. Having a structure within their tasks and working day is very important for doctors: within the consultation this helps them to cover all the topics which makes them feel secure. It also allows them to spend the time within the consultation as optimal as possible. In order to do so the transparent information about a patient is key. Due to the internet and the referral mentality of the specialist, general practitioners often do not feel acknowledged for their skills and knowledge.

" I am not an administration office, I am a doctor with a lot of knowledge and skills. I am not an extension of the specialist "

" I follow a standard list in my head. This gives me guidance to know whether I have asked everything I need to ask "



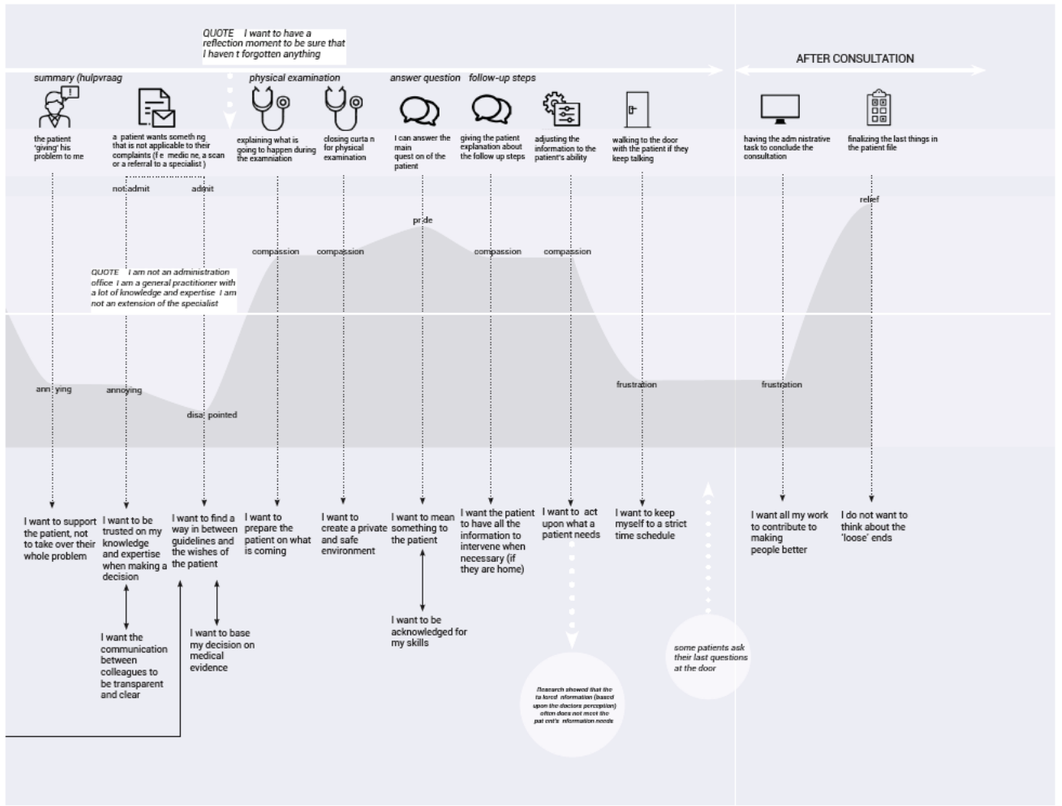


Figure 6: specialist and general practitioner experience timeline

B.6 Validation results

Goal:
The goal of the creative session is to verify the results of the user study and to explore and define design opportunities based on the results from the user study. Which results are valuable and recognizable for further development, and why? Four future doctors helped to prioritize the findings.

This session has resulted in the five main conflicts and the five main matches and to four design opportunities (paragraph 2.3.3).

Method:
This session is divided into three parts:
- Most important moments to future doctors, based upon the experience timeline
- Finding matching and conflicting concerns within the timelines
- Identify most important design opportunities

PART 1: Distinguish which moments are the most important to future doctors and why.

Positive moments:
- The moments that support an effective consultation are marked as the most decisive moments:
- The personal contact is indispensable. It helps the doctor to create a social basis, which is beneficial for the rest of the consultation. The patient often opens up earlier.
- Having patient documentation that is trustworthy and correct gives the doctor a satisfied feeling
- A consultation is succeeded when I have answered the question of the patient.
- Proper preparation gives the consultation already guidelines, and therefore it makes the consultation more efficient.

Negative moments:
- The moments that do not contribute to finding the
- answer to the 'hulpvraag', in an effective way, are marked as unfavourable.
- If patients keep talking when the consultation is over, I want them to leave so I will walk them to the door.
- Having a lot of administration makes that spent more time behind your computer than helping a patient.
- When documenting the story on the computer, a patient stops talking. It feels as if I am in a hurry.

Improvements:
The improvements are also focussed on efficiency. To make the consultation more efficient, the doctors would love to give the patient guidelines to remember the information and to follow the given treatment plan. They also want to make the waiting list for the patients shorter. It could be an option that the doctor chooses who they see and when to help patients in need earlier.

Helpless moments:
Lastly, moments are identified where the doctors feel helpless:
- A patient does not feel treated personally when specialists are following the checklist
- They keep up with their schedule, although they know that a patient looked forward to the consultation for weeks
- When the specialist asks for the personal story, but the patient does not understand what is relevant for the doctor to know and what is not.

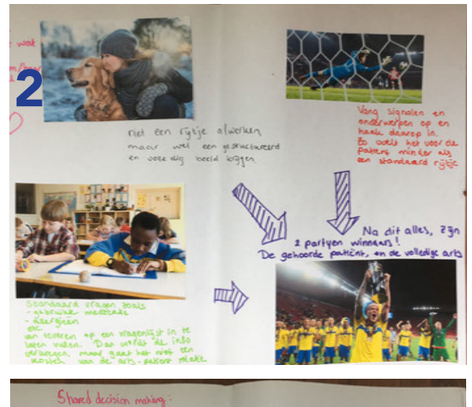
PART 2: Finding matching concerns and matches. The result of this part is visualised in Appendix B5.

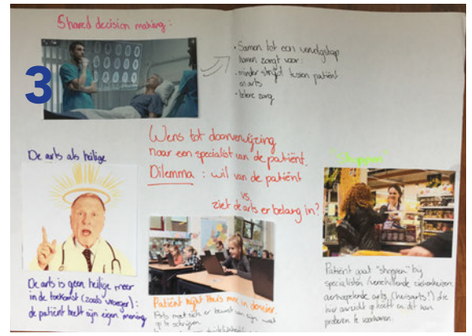
PART 3: Identify the most important design opportunities

Four main opportunities are shaped. They are formulated as:
1. Reaching consensus together with the help of shared decision making
2. Giving the patient a feeling of uniqueness, but providing structure to the doctor
3. Handling the different interest of the patient and the doctor
4. Ensuring clarity of the follow-up steps when the patient is at home

All four opportunities are explored for the year 2030 by the four participants. In figure 8 the results of these explorations are shown. These opportunities have been used as an inspiration for the formulated design directions (Appendix D).

Figure 7: validation of the results of the timeline





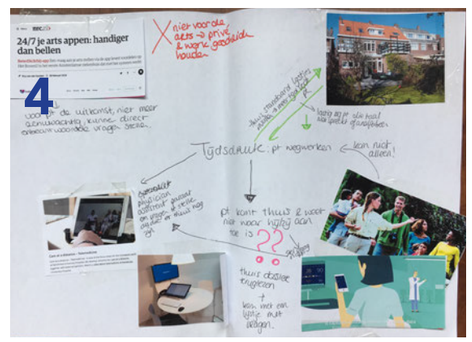


Figure 8: creating design opportunities

B.7 Conflicting and matching concerns

The conflicting and matching concerns are visualized in Chapter 2.3.3 This chapter describes the conflicts in words.

Conflict 1: Checklist
The doctor uses checklists and the computer to document the information. It makes the patient feel disappointed and not treated personally. The doctor is satisfied because he builds a trustworthy database of the patient's information. Specialists do have an internal conflict because they can not give their full attention to the patient.

Conflict 2: Common understanding
The moment of reaching a common understanding gives the patient doubt. Now the patient has no accurate overview of the applicable information and does not know if all the necessary information is there. They doubt if they can go on individually: can I do this alone? The doctor feels compassion when telling all the information required to a patient, but has an inner-conflict with time. If the time limit is near, they will not always take the time to explain the follow-up steps clearly.

Conflict 3: Confirmation
The patient wants confirmation on the information they found on the internet, while the doctor does not always give this confirmation. The doctor wants to be acknowledged for their skills. For example, the patient wants a brain scan, but the doctor knows a scan is not necessary. The patient has created hope for getting the scan, while the doctor is frustrated because of the distrust in his knowledge and skills: a scan is not necessary. This conflicts in a consultation.

Conflict 4: Information exchange
The doctor feels compassion when they adjust the information to the patient's ability to understand it, while a patient often feels confused by the information they receive. Literature shows that this tailored information regularly does not meet the patient's needs, and since this information is mainly communicated verbally, the patient does not remember most of it after the consultation.

Match 1: First impression
Both patient and doctor find the first impression necessary for the social and medical basis. The doctor feels challenged to put energy into the patient, while the patient feels gratitude and cares for.

Match 2: Neutral attitude
Both patient and doctor want the doctor to have a neutral and uninhibited position, but also strive to know each other on a social level to deliver and receive proper care.

Match 3: Personal story
Telling the personal story is a crucial and decisive moment for patient and doctor. The patient feels satisfied because they expect a doctor to take their perspective into account, and the doctor feels compassion for listening to their story. However, patients and doctors have internal conflicts as well: a patient can feel disappointed because they get the feeling that the doctor does not know their complaint beforehand, and the doctor feels frustration when the patient talks too long about their complaint due to their time limit of the consultation.

Match 4: Physical examination
The physical examination is a special moment between the patient and the doctor. The patient feels satisfied, and builts up trust because the doctor looks at their complaint, while the doctor feels compassion by having an accurate diagnosis. Besides, this moment is also one of the reflection moments of a doctor.

Match 5: Main question
When the answer of the patient has been answered, the patient feels satisfied because their expectation is met. The doctor feels pride because they mean something to the patient.

C: Guidelines

The guidelines are divided into practical guidelines and experience guidelines. The reason for this division is to make a separation between the practical part of the design (costs, usage, quantity) and the aimed effect of the final concept (patient and doctor experience and the impact of the design).

C.1 Practical

These guidelines are based upon Puch's checklist (Delft Design Guide)

- The concept should serve all patients of the Erasmus MC, those patients who are for a longer time in the health process (also different levels of intelligence, involvement etc.)

The case study focusses on diabetes type 1 patients, therefore the concept should serve all patient of the Erasmus MC diagnosed with diabetes type 1.

- The concept should be adjustable to the various departments within the Erasmus MC
- The concept is implementable in the year 2030, being in line with the established future vision.
- The concept is economically feasible
- The concept is having the right cost/effect balance (minimum input/maximum output)
- Innovativeness: the solution is new to the Erasmus MC and their doctor's

Environment:

- The product should not have a negative influence on the patient experience
- The product should not distract the patient and the specialist from the conversation; it should contribute and support.

Life in service:

- The product should facilitate the conversation of all patients within the Erasmus MC
- The product should be used every day, several times

Aesthetic appearance and finish

- The product should provide a calm presence, giving the feeling of trust.
- The visualisation should be understandable at one glance to all different patients.

Standards, rules and regulations

- The product should provide privacy for the patient
- The product should enable the patient to have control over the data
- The product should be linked to the portal of the Erasmus MC
- The product should guarantee the patient's privacy before, during and after usage

Ergonomics

- The usage of the product should not give any serious complaints to the specialist (since the specialist is using the interface daily).
- The usage of the product should not give any serious complaints to the patients (no negative effect on their treatment plan).

Reliability

- The product should not cause misdiagnosis or a wrong interpretation of the patient
- The product should not have a leading role in the health process, but a supportive one

Testing

- The product should be tested with diabetes patients and specialists from the Erasmus MC

Product policy

- The concept should make use of technology that supports both patient and doctor along the health process

Societal and political implications

- The concept should have the right balance between time, money and quality to be used by the doctor and the Erasmus MC

C.2 The aimed effect

Patient experience

The main focus of this project is improving the patient experience. This shows the essential criteria to establish a positive patient experience.

Personal approach

The concept should provide a personal approach to the patient:

- The concept should function as a buddy to the patients, that helps them to remember their questions and give them confidence and support
- The concept should provide a 'logging' system so the patient can remember their health status, feelings and decisions over time
- The concept should adapt to the patient's needs and pace within the healthcare process
- The concept should grow/develop/adapt along with the patient's time within the healthcare process

Companionship

- The concept should stimulate the patient to share their expectations, preferences, values and experience with others/the Erasmus MC in a structured way
- The concept should give the patient support, also before and after the consultation.

Involvement

The concept should increase the patient's involvement in their healthcare process:

- The concept should make the patients aware of their behaviour around their

disease or complaint
- The concept should provide a reflection moment for the patient to think about what they find important
- The concept should develop the patient skills and knowledge around their complaint
- The concept should give the patient a sense of control over their health path

The concept should empower the patient to think along and give input over their healthcare situation:
- The concept should provide the patient with the possibility to safely explore their complaint (together with the Erasmus)
- The concept should provide the patient with the opportunity to explore and express their expectations, preferences and values.
- The concept should keep track of the patient's health data to create a medical basis for them and the Erasmus MC

Structure
The concept should provide a framework in which they can explore their health process and complaint to make the health process more understandable:
- The concept should communicate the patient's information on an intuitive and visual way
- The concept should provide structure and order in the information around the healthcare process (knowledge of the complaint, feelings, process, procedure).
- The concept should give the patient the possibility to explore the information around their complaint safely.

Specialist experience
When focussing on the consultation of the future, both parties need to be taken into account. Therefore there are also some important guidelines to take into account from the doctor's perspective.

Acknowledgement
The concept should acknowledge the doctor for their skills and their opinion during the physical conversation:
- The concept should give the doctor the feeling of having the time for a personal conversation

Structure
The concept should not interfere with the doctors' current way of working:
- The concept should give the doctor the possibility to follow their established procedure
- The concept should provide an overview about which information the doctor needs to ask the patient (f.e.: is my anamnesis complete?)

- The concept should give the doctor the possibility to document the relevant information
- The concept should not take more valuable time from the doctors than is currently done

Nurture
- The concept should provide the doctor information about the patient's preferences to guide the information correctly
- The concept should give the doctor the possibility to support the patient along the health process

Impact
The goal of this project is to design a new way of communication. This communication hopefully results in an intangible 'impact' during the conversation. These guidelines describe the aimed impact of the concept.

Facilitating change
- The concept should facilitate the shift to shared decision making for the patient and the doctor
- The concept should make the role division between the patient and the doctor clear
- The concept should have a holistic approach to the patient's condition
- The concept should create a better shared understanding between the patient and the doctor during the consultation

Connectedness
- The concept should create a shared history for the patient and doctor
- The concept should create a new way of communicating between the patient and the doctor, where they feel connected before, after and during the physical conversation
- The concept should connect the patient with the doctor at a social and medical level to create trust and to provide the continuity of care
- The concept should give the doctor/the Erasmus the possibility to support the patient throughout their healthcare process to create higher involvement

Technology
- Technology should be used to support both patient and doctor along the health process

D: Design opportunities

This chapter explains the three design opportunities that are defined as a result of the analysis. The design opportunities are discussed with the Erasmus MC. In the end, the exciting elements within the three opportunities are taken into account.

D.1 Manage expectations, preferences and values

Opportunity: create shared understanding by being aware of expectations, values and preferences of the patient

The aimed effect

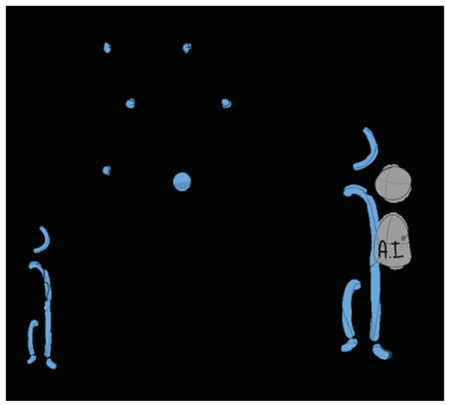
* This framework guides the patient through the necessary information and gives the doctor a clear overview of the expectations.

* The patient prepares the consultation, which buys the patient and doctor time during the consultation itself. A deeper level within the consultation can be reached ('the patient's story').

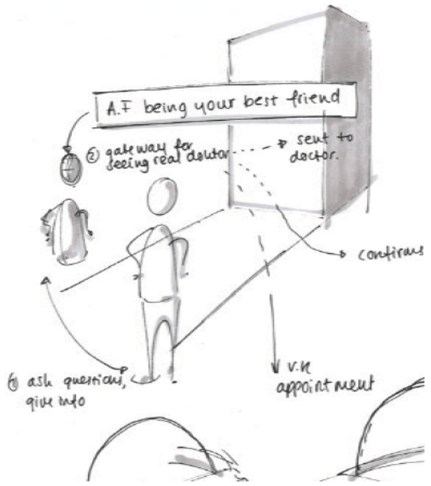
* The patient becomes aware of their own expectations, values and preferences, which can now be communicated clearly to the doctor.

* The doctor anticipates on the information given by the patient, which offers a feeling of high involvement of the doctor in their health process.

* The doctor keeps an eye on their data before and after the consultation, which gives them a feeling of not being alone.

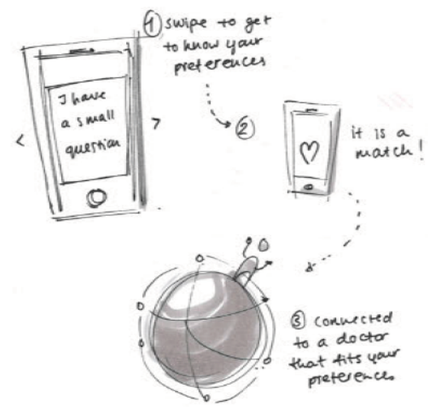


A framework that enables the patient to express their values and expectations of the consultation, to have a clear starting point in the consultation. The doctor is involved by providing the framework to the patient and uses the information to prepare the consultation.

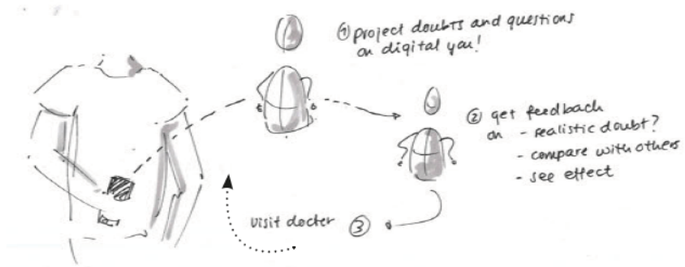


1 share your 'lifestyle' with the doctor: decide upon which information you share, you are the owner of your data! The doctor can prepare the consultation accordingly.

First ideas



2 match your values and preferences with your doctor:
find a doctor that works according to your preferences



3 check with your digital twin if your expectations are realistic:
- what happens if I quit smoking?
- can I walk after 2 weeks after my knee operation?

D.2 Being treated on demand

Opportunity: emphasize ‘the doctor’ being the confirmer, by giving the patients the information they want on demand

The aimed effect

* The patient is in control of their health data/influences their data use, which makes them a participant in the health process

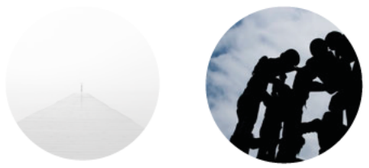
* Patient feels unique and heard since the advice is customized and on-demand

* Being linked to both patient and doctor makes the patient not feel alone within the health process.

* A pre-selection is made for the appointment since the service is solving ‘unnecessary’ complaints. There is more time for human contact during the consultation.

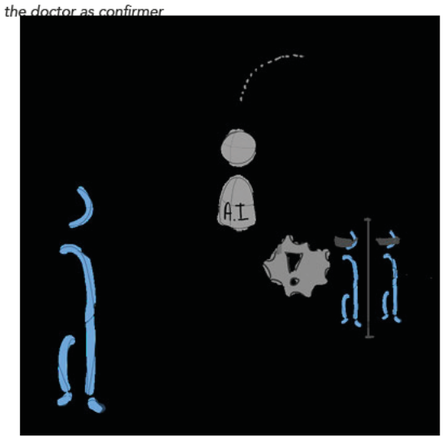
* Decisions are made based on clear and transparent patient information and evidence-based information.

patient as spectator ..... *patient as participant*



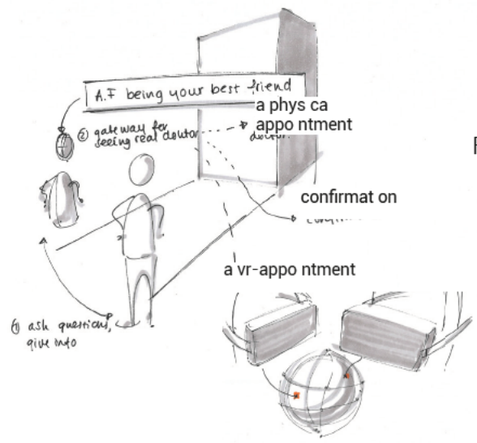
the feeling of being alone ..... *shared responsibility*

the doctor as confirmer

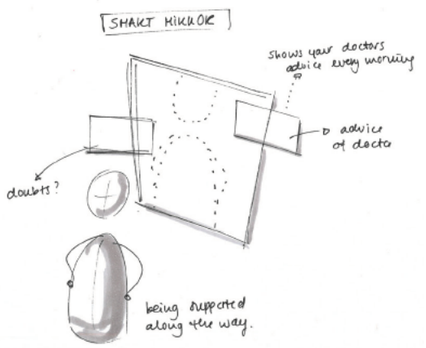


A product-service which gives the patient control over their health data. The service continuously keeps track of the health of the patient to provide advice and confirmation. The service provides the patient with a framework in which the information is gathered. Being linked to both patient and doctor, the technology makes that the patient does not feel alone in the process.

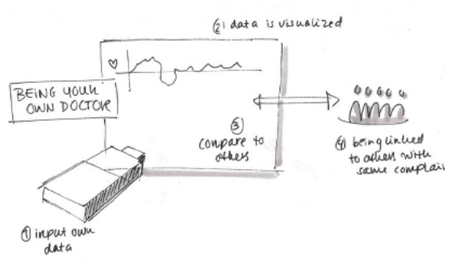
First ideas



1 A.I. as gateaway to an appointment: an A.I. assistent can confirm the early doubts of the patients, the A.I. can offer a VR-consultation with an available doctor, or sent you through to real doctor.



3 A smart mirror which projects the advice of the doctor on demand:
this gives the patient the feeling of being supported along their health traject, on demand (live?) information



2 Be your own doctor: by comparing your health data with other patients compare your healthdata, get confirmation that everything is ‘right’, talk to patients with same complaints

D.3 A shared framework

Opportunity: bring the human conversation back by making technology the framework/guidance of the conversation

The aimed effect
* By having structure and overview within the consultation, the patient can be more involved during the conversation.

* It is for both patient and doctor clear where they are up to and where they are within the consultation.

* The conversation can be held at an equal level since both patient and doctor see the effect of their input.

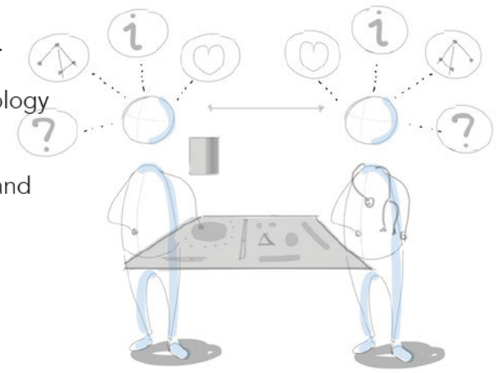
* Human contact is back by technology as an enabler of the conversation.

*The patient feels taken seriously and the doctor can focus more on the patient.

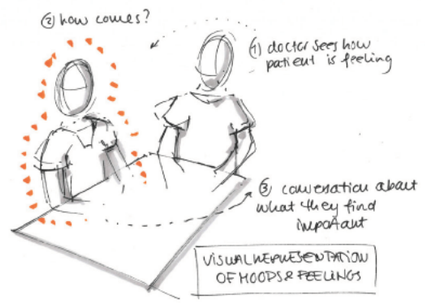
patient as spectator ..... ▶ *patient as participant*

technology as disenabler of human contact

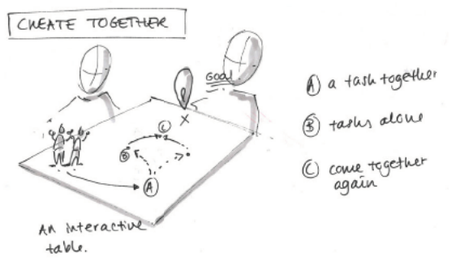
human contact wins it from technology



A product that connects the patient and doctor at a social and medical level, using technology as a shared platform. The doctor provides the patient a framework in which the patient can 'play' and where the patient provides their expectations and health data, in order to give both patient and doctor order and responsibility within the conversation.

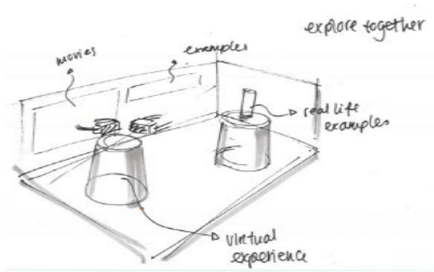


1 An emotion and mood recognizer:
it gives the doctor an inside in the mood and emotions of the patient, in order to 'feel' what important is to the patient, and steer the conversation in that direction



3 create the structure together:
visualize the common goal of the conversation, and see where both P and D are 'standing'. A visual effect of the given information. This might be that the patient gets a task and the doctor gets a task, when they are both complete the conversation can go on.

First ideas



2 explore together:
go through an experience room with your doctor at the first appointment: where do you experience pain? how does that body part work? see, touch, explore

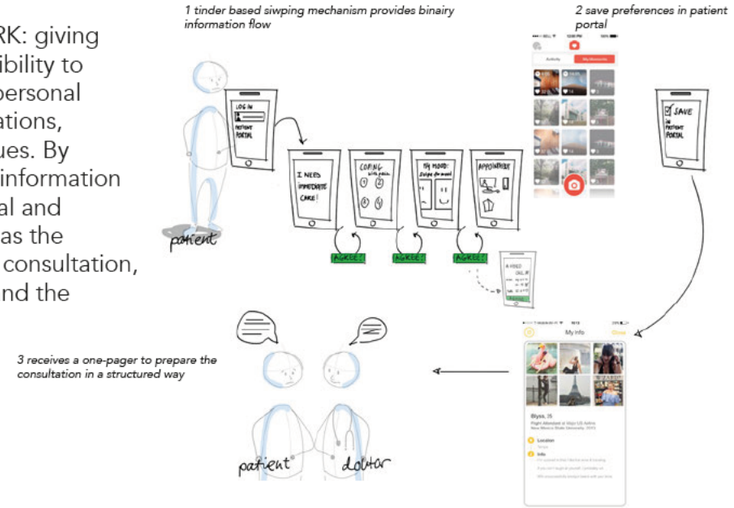
E: Search areas

This chapter describes the six search areas. The search areas are the result of the evaluation session with the Erasmus MC and the TU Delft.

E.1 Data collector

MECHANISME: collecting patient information in an intuitive way, giving the control to the patient

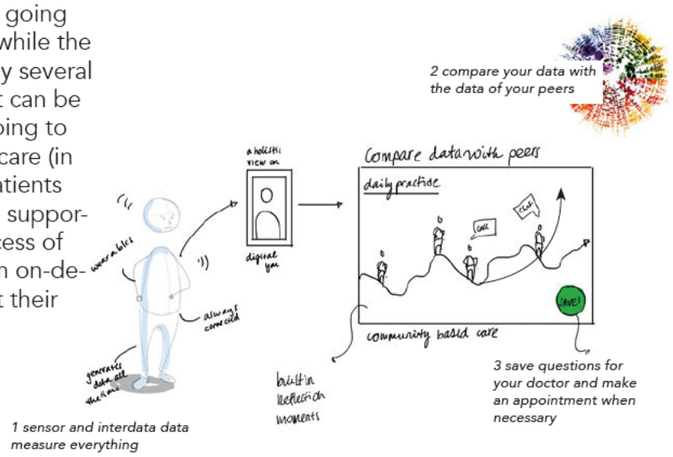
HOW DOES IT WORK: giving the patient the possibility to communicate their personal information, expectations, preferences and values. By communicating this information to the doctor, a social and medical basis exists as the starting point of the consultation, which creates trust and the continuity of care.



E.2 Being your own doctor

MECHANISME: reassurance of your own data + the data of peers (peer support)

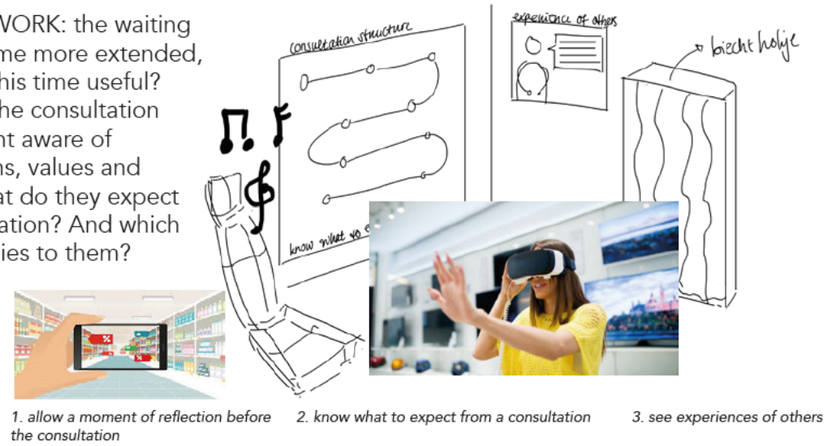
HOW DOES IT WORK: for a patient, it is the first time going through a health traject, while the doctor has done it already several times. There is a gap that can be filled by peer support, going to community-based healthcare (in line with future vision). Patients have the feeling of being supported along the whole process of care. The data gives them on-demand confirmation about their state of being.



E.3 Waiting room experience

MECHANISME: prepare the consultation with structured and guided information while waiting

HOW DOES IT WORK: the waiting times only become more extended, so why not use this time useful? Preparation for the consultation makes the patient aware of their expectations, values and preferences: what do they expect from the consultation? And which information applies to them?



1. allow a moment of reflection before the consultation

2. know what to expect from a consultation

3. see experiences of others

E.4 Guided in the conversation

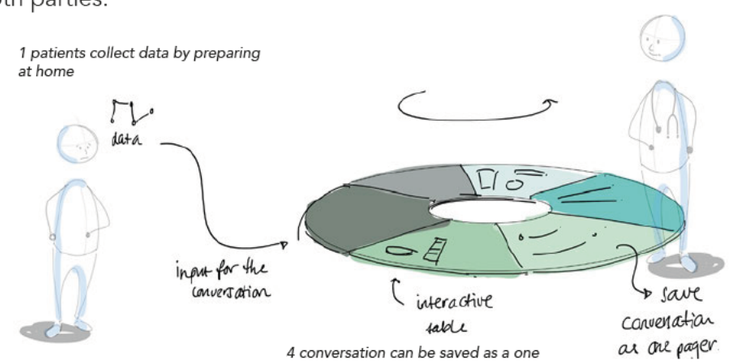
MECHANISME: using a shared framework to structure the conversation

HOW DOES IT WORK: Both patient and doctor use the same framework during the consultation to create structure, guidance and higher involvement of both parties.

2 input of patient is seen on the interactive table

3 patient and doctor have structure in the conversation

1 patients collect data by preparing at home

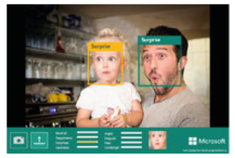


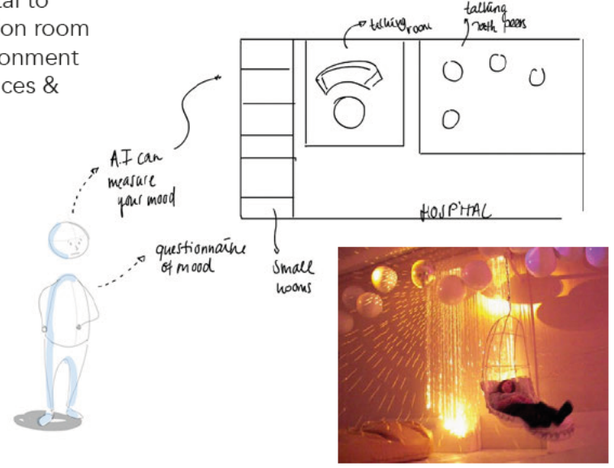
4 conversation can be saved as a one pager to take home

E.5 Health path adjusted to your needs

MECHANISME: mood and preferences as the base of the consultation

HOW DOES IT WORK: the A.I. knows how you feel, which is communicated to the hospital to assign the perfect consultation room to you. In this way, the environment is based upon your preferences & needs of that moment.

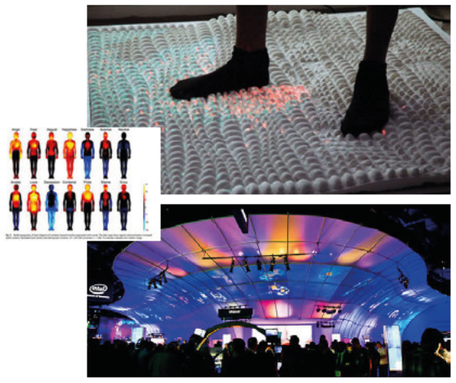




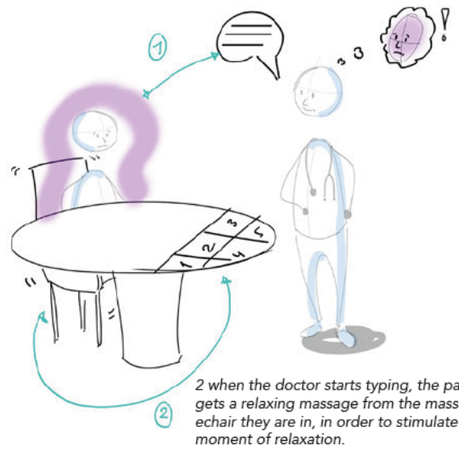
E.6 Real time feedback

MECHANISME: become aware of eachothers perspective

HOW DOES IT WORK: By giving realtime feedback to both the doctor and the patient, they are aware of their behaviour. In this way, they can consciously behave accordingly to steer the conversation in the right direction.



1 the doctor is aware of their emotional impact on the patient



2 when the doctor starts typing, the patient gets a relaxing massage from the massag echair they are in, in order to stimulate a moment of relaxation.

F: Idea directions

As a result of the six search areas, five idea directions are developed and tested. The participants were asked to rank the different ideas based upon the most important criteria. This evaluation has given the designer an insight in which idea directions are fruitful to go on with.

Goal:
The goal of the user evaluation is to discover which idea directions fit the user's needs.

Method:
Three participants are asked to read the scenario and to answer four questions:

- What is your overall experience of the idea?
- What are the positive points of the idea?
- What are the negative points of the idea?
- Do you see any improvements?

Furthermore, the participants are asked to rank the idea of eight different criteria. Those criteria are based upon the user research and the design goal. By classifying the ideas on those criteria, the designer gets a better insight in which ideas are in line with the design goal and the user study.

The scenarios that are used during the evaluation are found on the next pages. Due to space limits, the scenarios are turned 90 degrees.

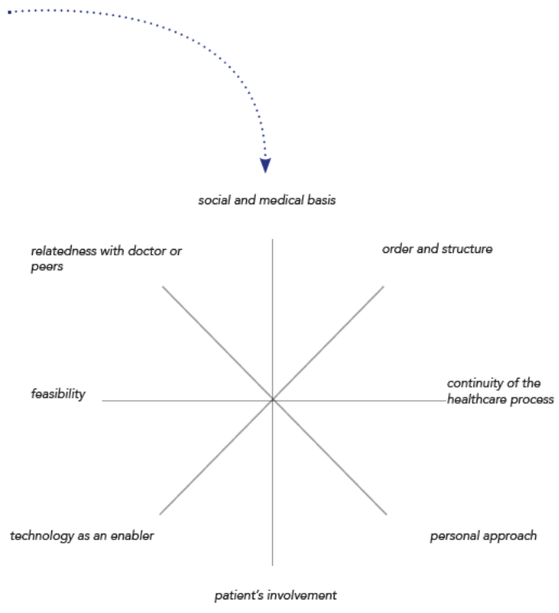


Figure 9: strategy wheel (Buijs and Valkenburg, 1996)

F.1 Prepare, share, connect

intuitively collect and visualize information before and during the consultation

Figure 10: written scenario

General experience of the idea

+ The user likes to have the standard questions in service since it saves time during the real conversation. They compare it with the travel vaccination appointment.
+ Tracking and logging my data is positive. They like the idea of building up a history on which they fall back in the future.
- The service gives the first indication of your complaint, but how does a service gains trust in the accuracy of the answer?

Value for the user

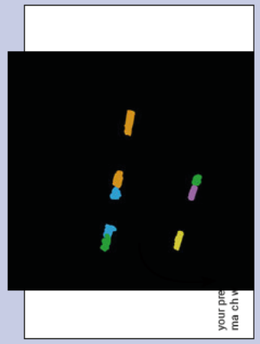
- Reflection: the possibility to share your thoughts immediately and have the opportunity to think about yourself and the problem beforehand is received positively. The participants are impressed by the fact that this service goes beyond the information of the complaint. They see the added value of taking the mood into account.
- Saving information: correctly processing your information by a logarithm and keeping the information for later references is preferred by the user
- Control: have a sense of control over the timing of the appointment

Points of discussion

- Time: is the doctor able to prepare the consultation based on my information?
- Flexibility: What if I want to have a physical appointment and the app guides me in the direction of a phone call? Is there an option that I can go around the triage of the service?
- Filter: How does the app differentiate a 'useless' complaint v.s. a urgent complaint?

Design improvements

+ The app should give suggestions, and not force the patient into an option.
+ Make clear that this tool is a preparation for the consultation. In this way, the user's expectations are managed by making clear that it is a tool to prepare the consultation: I fill this in because the doctor can help me better.
+ Add a personal approach when using the service for the first time.
+ Add a tool in the conversation that is linked to the given information



When entering the consultation room, a shared framework between you and the doctor communicates the structure of the conversation, including your personal preferences. In this way your preferences are linked to the physical conversation. Due to the same colour coding in the patient portal and in the shared framework, you will recognize the topics of the conversation easily.

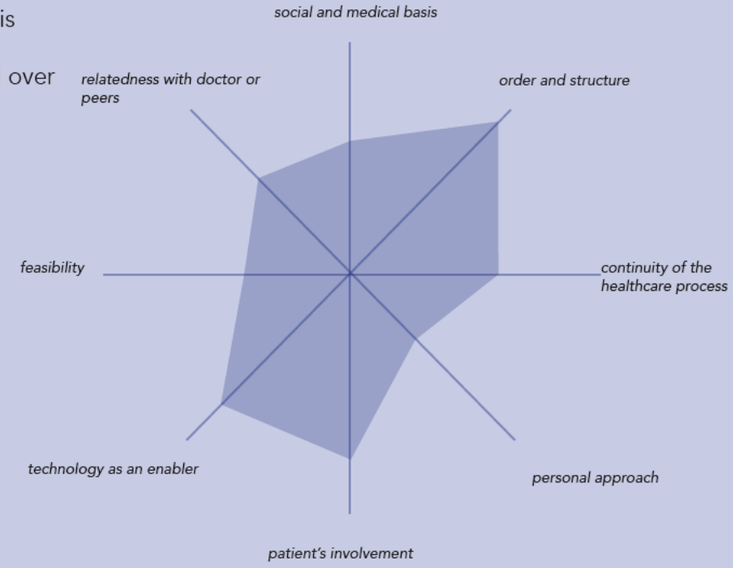
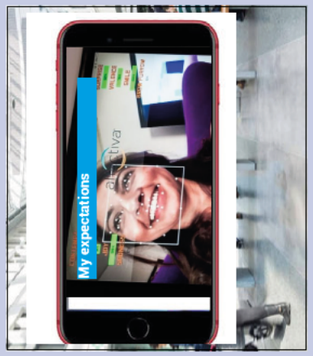


Figure 11: strategy wheel (Buijs and Valkenburg, 1996)

F.2 The hospital experience

Being guided in the hospital from the moment you enter

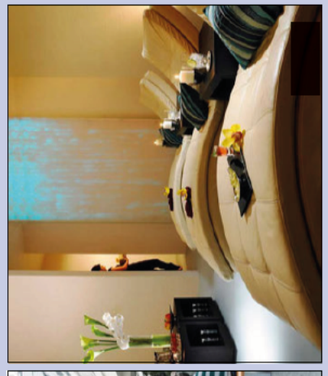
get familiair with your doctor



Since you do not have to wait in the waiting room, you want to get aware of your own expectations. You click on 'expectations' and a mood-scanner appears. This tool makes you aware of your mood which allows you to have a moment to reflect: why do I feel that way? What influences my mood? The services gives you options to discover the reasons..

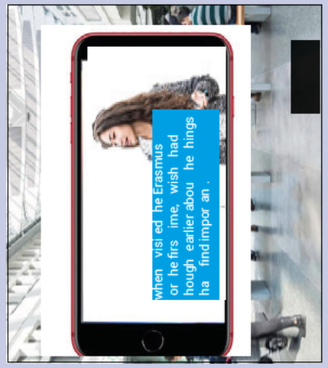
Because you have communicated your mood to the doctor, the consultation room, the atmosphere and communication approach of the physician have adapted to your mood scan. The environment adapts to your needs.

The four different topics that appear are: the time, the doctor, the department and your expectations. All four options have interactive features when clicking on them. The time-option gives you real-time feedback on the progression of the doctor. Therefore you do not have to spent 'useless time' in the waitingroom. You can also get familiair with your doctor, or even explore your own expectations.

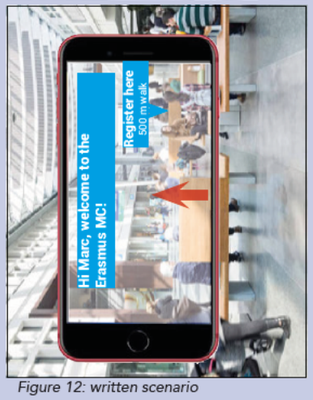


After having heard experiences of previous patients, you choose for a moment to relax in order to calm down before your appointment. Your phone automatically keeps track on the appointment time and buzzes to make you aware that your appointment is about to start.

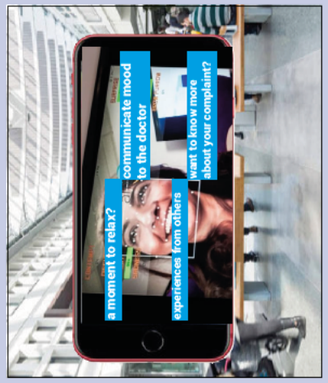
At the registration pole, you scan your QR-code of the appointment that you received when making the appointment. Now the hospital nows that you are here. After this, four different topic pop-up.



First you choose to communicate your mood to the doctor because you find it important that the doctor understand how you are feeling. After, you choose for 'experiences from others' and a patient appears in the AR experience. Other patients give you tips and tricks about the consultation and insightful information in relation to your complaint.



You have an appointment at your cardiologist. When you enter the hospital, your phone automatically logs in in the patient portal. In this way, your phone gives you personalized information and instructions. First, it guides you to the registration point in the hallway.



The service gives you suggestions according to the moodscan. The mood scan has seen that you are stressed and therefore gives you an option that guides you to the relaxing area. It also gives you an option to discover more about your complaint, or to hear experiences of other patients having the same mood as you do.

Figure 12: written scenario

General experience of the idea:

+ The user likes to spend their waiting time useful. It makes them feel comfortable, but the activities need to be related to the appointment.
+ Getting to know your doctor before the conversation is positive: it makes the appointment more personal, and it creates trust beforehand.
+ A personal guidance or support in the hospital is received positively, so the user does not feel alone or lost in the big hospital.

Value for the user:

- Personal approach: with this idea t feels like the hospital takes their personal preferences into account.
- Interactive: an interactive activity during the waiting time helps to comfort the user while waiting.

Points of discussion:

- Mood awareness: if a patient becomes aware of their mood, it can also work the other way around: the patient might get a higher stress level.
- Environment: if a room is adapted to the emotion of the patient, the patient doubt if they feel being taken seriously. The problem and the emotion are 'toned down' while they need to be present during a conversation. It can work against you.

Design improvements:

+ Make the service more human by adding a personal guide that can support you along the whole traject: preparing your consultation and helping you in the conversation.
+ Sharing experiences of other patients seems useful, but not when you just arrive in the hospital. You want to receive this earlier in the process.
+ The control is in the patient hands: give the patient an overview of all the choices first, after which you let them choose themselves

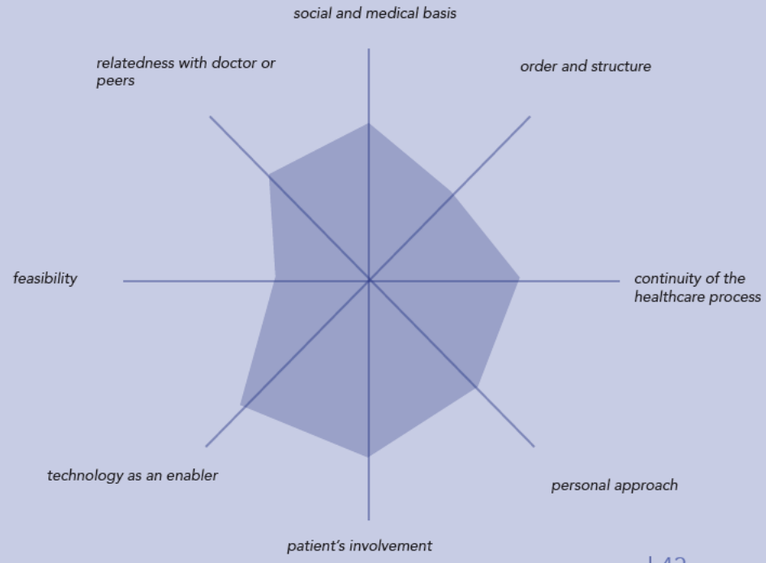


Figure 13: strategy wheel (Buijs and Valkenburg, 1996)

F.3 The quantified self

Community based care & peer support at a distance

Based on the given information, you put in a certain patient group. You are put in patient group 1. At this page you see the data that is gathered about you. At this moment, you want to compare your data to the data of your peers, in order to get confirmation on your doubts around your knee-operation.

Lastly, all this data makes it possible to give community based care (which is in line with the future vision): advice to bigger groups and give care at a distance. The doctor can keep track on more patients simultaneously.

When you have made your appointment, the doctor receives a one-pager with the collected data. The doctor can immediately see where your data differs from the data from your peers. The doctor can prepare the consultation accordingly.

You start chatting with peers in order to feel not alone with your complaint, knowing that they face the same problems. It gives you confirmation on the little doubts, but unfortunately, you notice that your data is a bit different than the data from your peers. You request an appointment at the physician for a check-up

You enter the big-data screen where you can compare yourselves to your peers. This data is visualized n a trustworthy and visual way. The service gives you the opportunity to ask questions, to chat with peers.. It will give honest feedback, also if your data is very different from your peers.

Luckily, the Erasmus MC portal offers the possibility to link all the different data-services hat you use to collect your data: your apple health data, your bank account, your google-hits and the data from your wearable. This creates a digital holistic YOU in the patient portal of the Erasmus MC, knowing how you life, what you can spent and how your health is doing.

Half a year ago, you have had a terrible knee operation. You have been in the hospital for more than a week and you are still recovering. Sometimes you are insecure about which things you can do with your knee and which things you can not do. Somethings you are insecure about what you feel: is it just pain? or is there something wrong with my knee? And.. how are other people feeling having had the same knee operation?

Hi! This is you, you live in the year 2030 and all your data is being collected, measured, saved and used by different companies to make your online-life as personal and unique as possible. In 2030 the word patient does not exists anymore: it is about people measuring their health like everything else is measured. You are one of them, actively measuring all the data that you generate.

Figure 14: written scenario

General experience of the idea:

+ The user has the idea that their complaints are being heard. Being linked to other patients feels comforting. On the other hand, the patients of today don't always trust computer advice because the computer does not know them personally.
- One user doubts about the real benefit for the doctor and the patient

Value for the user:

- Not alone: a personalized source of information works well if you are facing the same problems as others. It is also nice to know when your complaints are unique. You can draw the first conclusions from your self.
- Motivation: you are not alone, and that gives motivation for doing f.e. physicals practices.
- Feedback of peers: it is good to have a platform where you can share your emotions and experiences with peers; it feels like being heard.

Points of discussion:

- Privacy: the user is 'huiverig' about the amount of personal data which is online.
- Trust: how to trust the information and assumptions of other patients?
- Motivation: It can also setback your motivation when others are doing better than you
- Insurance discussion: do people who live more unhealthy need to pay more for their insurance? Now all their data is logged, so they are 'caught' within this system.

Design improvements:

+ The user needs to choose which information they want to share in order to have a feeling of control.
+ It is good to be in a certain patient group, but the user does not want to know in which group they belong to. They think that they are going to compare the patient's groups with each other and they do not seek for a competition.
- How is all this data visualized for the doctor? How do I know which information is known by the doctor?

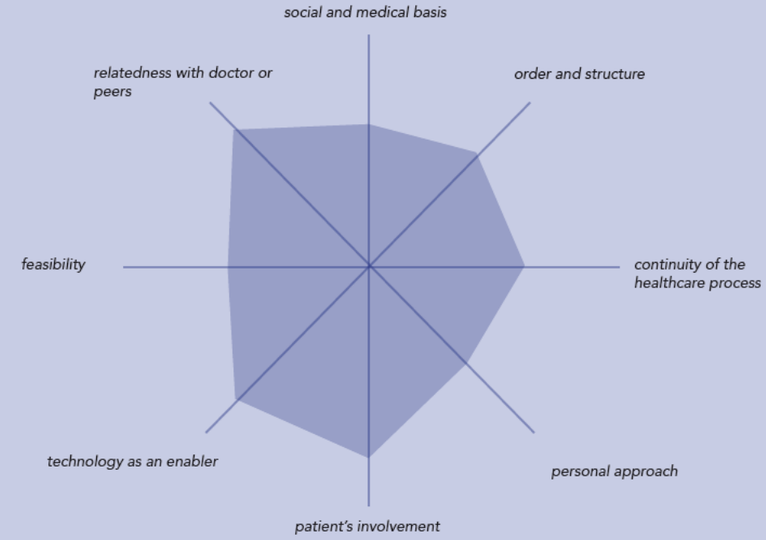
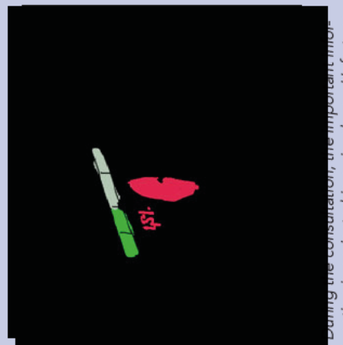


Figure 15: strategy wheel (Buijs and Valkenburg, 1996)

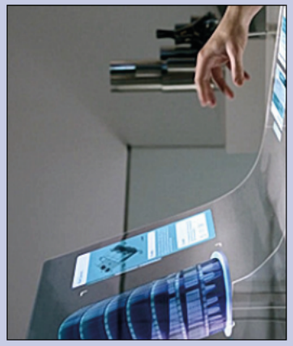
F.4 Transparant barrier

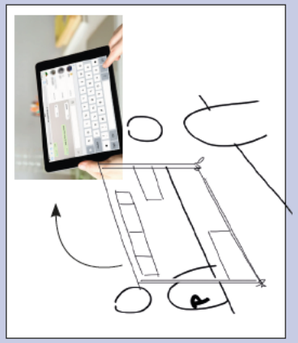
Understand each other's perspective by real time feedback during the consultation



The doctor start to ask you questions about the complaint. He/she receives information about your emotional wellbeing by having visual feedback on the interactive screen. He sees that you have HOPE. The doctor can adapt his communication strategy accordingly. When documenting the information, the doctor makes use of the projected keyboard that doesn't make any sound, so you do not fe*an example by the technology.*

During the consultation you visually see where you are, what you can expect and how long the consultation still takes. Due to this shared framework the world of the medicine becomes more understandbale to you.





In the consultation room, a transparant barrier is placed between you and the doctor. This screen is an interactive transparant display on which the information that you have given, is projected. In this way you can have eye contact with the doctor, but also communicate information in a visual way.

At the end, the most important take aways of the consultation are tranferred to your patientportal, by swiping them around. Both patient and doctor can look into this file when not being in the consultation anymore. In this way a medical history is created.

You are waiting for an appointment at the KNO-arts because you have pain in your ears. In the waiting room you are asked to fill some basic questions to prepare your consultation. How do you feel, what is your complaint? Those questions are saved in your patient portal.

The doctor puts the transparant barrier from a horizontal into a vertical position. In this way you can communicate better to the doctor what you do not understand. Since the display is interactive, you can touch and switch topics around in order to give priority.

Figure 16: written scenario

General experience of the idea:

+ Visual communication works for everybody, but the screen should not be in between the doctor and the patient
- As a patient, you do not want to know everything. On the other hand, this idea provides transparent care since you can see the information that applies to you.

Value for the user:

- Create together: this idea gives the patient and doctor the ability to create and document together during the consultation. In this way, they both feel ownership. Visual communication is key instead of using words.
- Transparency: The patient sees their files, notations and sees how the doctor processes this information. The tool helps to structure and summarize all the information. The conversation is structured transparently.
- Preparation: the user is positive about the preparation since it helps them to understand the conversation with the doctor better.

Points of discussion:

- Knowledge balance: do you want to see and know everything as a patient? You do not have medical knowledge.
- Placement: do not place the tool between patient and doctor! (next-level technology distraction)

Design improvements

+ Make the follow-up steps to the patient clear during the conversation.
+ A balance needs to be found between transparent care and hiding medical information that is not applicable to the patient's ears.
+ Make the concept adaptable to different patient profiles. A personal part of the concept could be to adapt the information that they are shown during the consultation.

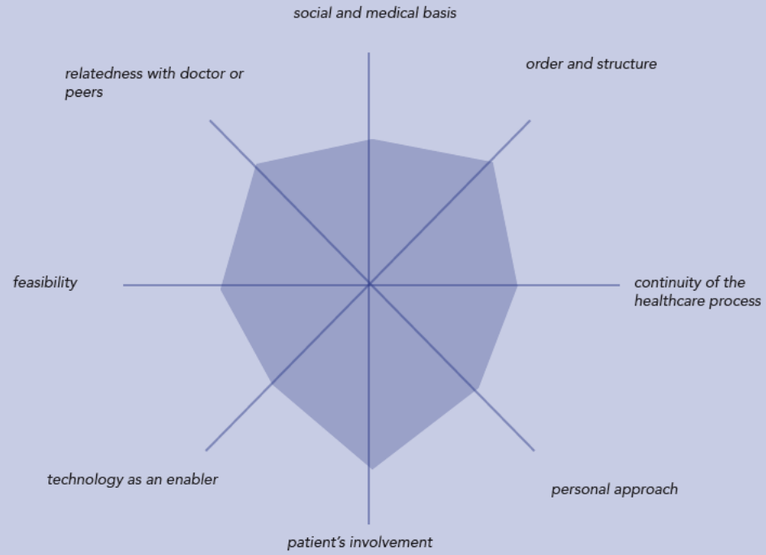
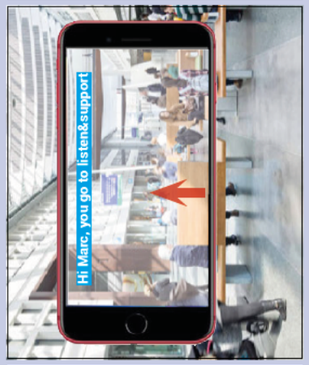


Figure 17: strategy wheel (Buijs and Valkenburg, 1996)

F.5 A new hospital

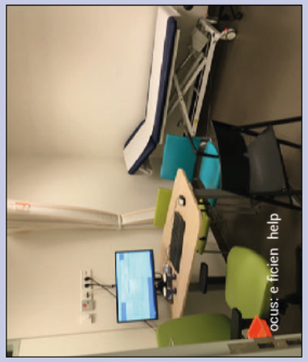
A hospital based on the needs and wants of patient groups instead of their disease

When entering the hospital, your phone gives you the route to your assigned room. You go to the department within the hospital that is called: [listen&support]. The servies has matched your complaint and mood to the environment of the hospital.



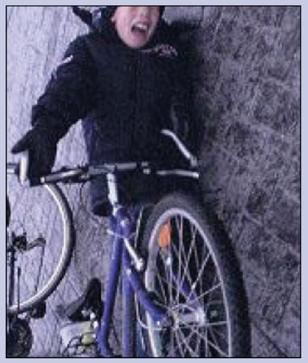
When making an appointment online, you clearly define your expectations and whishes: you are emotional around your complaint and are searching for help, since the complaint limites you in your daily tasks. An appointment is made and a location within the hospital is assigned to your complaint. You receive the location on your phone.

For quite some time you experience a huge headache and stress-complaints. You can not life your live to the fullest and you are in need of mental care and physical care. The GP can not help you anyfurther and therefore you want to make an appointment at the hospital.



When entering the hospital, your phone gives you the route to your assigned room. You go to the deparment within the hospital that is called [quick care]. The services had matched your complaint and mood to room that offers quick care. Therefore the environment of the hospital looks like that as well.

When making an appointment online, you clearly define your expectations and whishes: you are in need for a quick check upon your arm because you fell down and you think that it is broken. An appointment is made and a location within the hospital is assigned to you and your complaint. You receive the location on your phone.



Two week later, you fall of your bike and now your arm is hurting quite badly. You are in doubt if you need to go to the hospital... but after one day you decide that you need a quick check upon your arm to know if it is broken.

 Figure 18: written scenario

General experience of the data:

+ This idea gives comfort and trust when the first couple of times the services matches the right consultation to your complaint.
- The patients are also hesitant since they think that it can give the patient the feeling of not being taken seriously. On the other hand: don't you always have a comforting and practical need in one conversation?

Value for the user:

- A personal approach: a personalized service for your complaint is positively received since they have the security that the level of the complaint is matched with the level of help. It makes them feel heard
- Define needs: what does the patient think themselves, what do they need?

Points of discussion:

- Trust in the system: how to be sure that your complaint is matched with the right service? If not, it is a massive waste of time.
- Define needs: how does a patient discover their needs? this is a complicated topic.
- Both: what if you need a practical and comforting conversation at once? How can you make such a distinction?

Design improvements:

+ Split the consultation in two: an emotional/social talk' and 'physical help', this might result in a division in the hospital as well.
- Find a way that this way of working does not lead to a misdiagnosis. Give the patient their input as well.

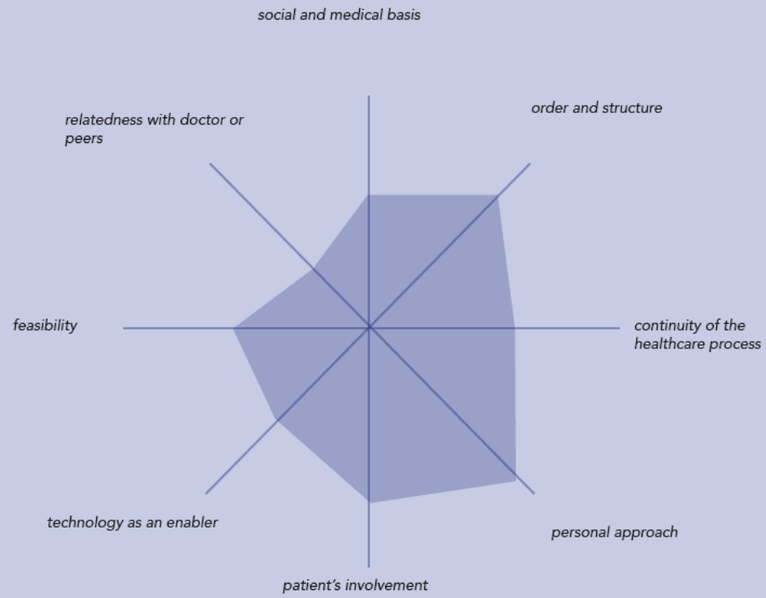


Figure 19: strategy wheel (Buijs and Valkenburg, 1996)

G: Concept scenario's

As a result of the evaluation session, three final concepts are formulated. Besides a 'praatplaat', a scenario is written per concept. Stories will allow people to let the design ground in the context of usage, and it will help to explore and define the design without having all the details complete (Quesenbery & Brooks, 2010). The scenarios are based on the case study of breast cancer.

G.1 The Erasmus Academy

This concept describes the scenario of the learn and explore-element within the patient portal. The scenario aims to communicate the future experience of the usage.

1 Je log in op de Erasmus Academy en zoek naar he opic da bij jouw in je gedach e zi . Je kies voor L FE' en vul in dysexuali y'.

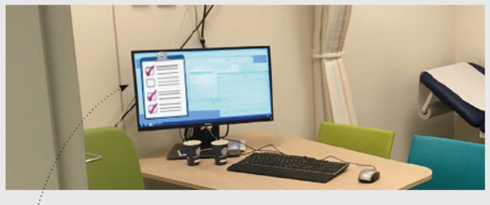
2 Nada je di heb gekozen, zijn er enkele sugges ies zich baar binnen deze ca egorie. Je kies voor he onderwerp: kinderen", omda di voor jou op di momen he belangrijks e is. De andere opics lijken je relevan , maar die bewaar je voor la er.

3 Je zie een pagina voor je me verschillende ar ikelen, ervaringen van pa ien en, maar ook podcas van opgenomen consul s. Je kies ervoor om de podcas beluis eren waarin jouw onrus besproken word . Je gaa op de bank zi en me een kop hee en luis er he volgende ragmen :

4 Deze podcas hee je een kijkje gegeven ach er de schermen: in iem maar anoniem. Je wee da je nie de enige ben me deze onrus in je hoo d. He hee je gerus ges eld en je wee da je nie alleen ben . Ech er heb je ook wa inhoudelijke vragen over je diagnose. Wa doen die kwaadaar ige cellen me mij En wa doe welke behandeling?

5 Je kijk een filmpje waarin word ui gele wa de kwaadaa dige cellen me je doen Er is ee A echnol gy aan oegevoegd: de digi ale en ysieke werel mixe e neem een kijkje binnen je lichaam m op een 3D manier e begrijpen wa er binnen in jouw gebeurd. n ussen duu he nog maar enkele dagen o je consul en heb jij je groo s e wij els al wa aandach gegeven.

6 Op de dag van je a spraak ga je naar he ziekenhuis. Ook in he ziekenhuis zijn ysieke ruim e gelink aan de jouw Academy. n de wach kamer zijn video's me ervaringen van andere pa ien en e zien, waarin zij ver ellen over verschillende behandelingen, je kan me een VR-bril een our door je lichaam maken, o de laa s e filmpjes bekijken. Deze in orma ie die jij opdoe kan je ui eindelijk ook gebruiken om ijdens de ysieke pa ien groepen je si ua ie duidelijker e beschrijven.



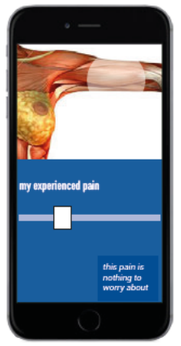
6 Tijdens he consul ben jij goed op de hoog e van de nodige in orma ie. Je heb je wij els al gehoord' via de podcas en di is een verbindende ac or/kennis ussen jouw en de doc or. De podcas hee ervoor gezorgd da je meer open over je klach en dur e pra en. Gelukkig is de ar s op de hoog e van welke podcas s en in orma ie jij heb opgezoch (overview), zoda hij op de hoog e is van jouw kennis-niveau, maar ook van jouw zorgen en wij els.

Figure 20: scenario Erasmus Academy

G.2 The digital patient I.D.

This concept describes the scenario of the track and log-element within the patient portal. The scenario aims to communicate the future experience of the usage.

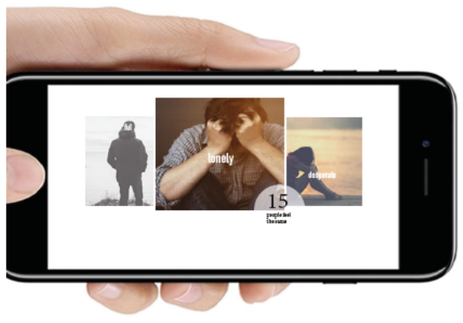
1 Eers klik je op je ysieke welzijn. Je heb voorname ij las van je linker arm: je heb moei e me he illen van boodschappe . Je klik p je linker arm en gee aan hoeveel p jn je e vaar .



2 Door de slider van links naar rech s e bewegen, kan je aangeven hoeveel pijn je heb . Je krijg eedback op je ervaren pijn: je hoe je geen zorgen e maken. Toch ben je benieuwd hoe andere mensen deze pijn ervaren en je wil je resul aa vergelijken.

3 Hier zie je de ruwe da a van pa ien en en hun pijn ervaring. Je zie da jij ver van de kern a zi , en dus gemiddelde pijn ervaar . Ook zie je hoeveel andere mensen me jou deze pijn delen.

6 Na 1,5 maand je digi ale zel e voeden, heb je enkele gesprekken me peers gehad en je ben je bewus er geworden van je eigen gezondheid. Tijdens he consul word jouw digi ale versie de basis van he gesprek ussen jouw en de ar s. De mees e wij els heb je al besproken me je peers, maar hier re ereer je kor naar ijdens he gesprek. De in orma ie over jouw welzijn is zich baar op een in erac ie scherm. He is een gedeelde ool voor jou en de dok er. Door e klikken op verschillende lichaamsdelen, word de in orma ie zich baar.



4 Je vul ook je men ale welzi n in. Je voel jezel be waard om ver de krach ui val in je arm e pra en me je sociale omgeving Je wil j nie zwak en ziek voelen in je sociale omgeving. n u ie swipe je vo r de mood van de dag en je gee aa da je je alleen v e Je krijg e ien da 15 andere mensen, me dezel de diagnose, zich die dag he ze de voelen. Je voel je minder alleen e je zou graag me z pra en

5 En da is mogelijk... door de digi ale versie van jezel e voeden me in orma ie, wee he pla orm over welke onderwerpen jij wil e lezen. Je zie da er een discussiegroep ac ie is over krach verlies in je armen en jij voeg jezel oe, zoda je samen me je peers over di onderwerp kan pra en. Doorda pa ien en pra en over verschillende opics, wee de polikliniek welke onderwerpen veel worden besproken en kunnen op deze manier ook advies geven aan een groep als geheel. Op deze manier kan de poli an woord geven op veel voorkomende vragen.

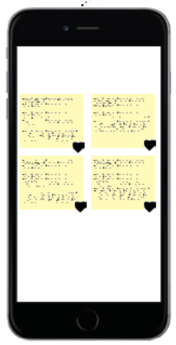
Figure 21: scenario the Digital Patient Profile

G.3 Quality time

This concept describes the scenario of the reflect and prepare element within the patient portal. The scenario aims to communicate the future experience of the usage.

1 Je opent de app en se cte t op e chaam het punt waarover e w praten waar gaat e k acht over?

2 Naar aan e d ng van e gekozen focus punt (de over ge fo - mat d e het pat enten port b j houdt), et p atfor ge f e suggest es over onde we pen Je k kt op nkerborst

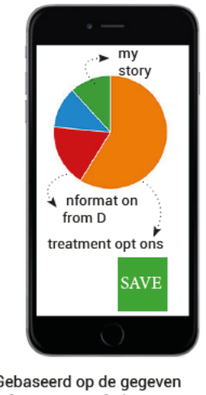


3 Het p atform heeft versch ende hu pvrag n geg ereerd, waarvan j j kan k eze we k h t beste b j ouw gedachte past

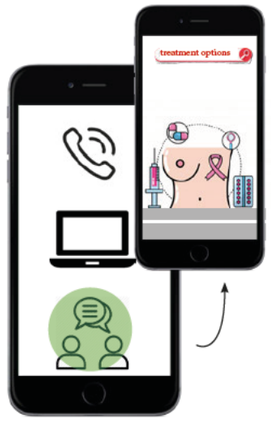
4 Daarna z jn versch ende moods te z en Je k est de mood d e st b j d k acht d e je net b nge- vu Je est verward

5 Er wordt je gevraagd waarom j j je zo voe Je voe t j verward, omdat je n et weet wat je te wachten st , n et eet hoe oekomst er t z et en geen ve z ht hebt over de behande ngsm thoden

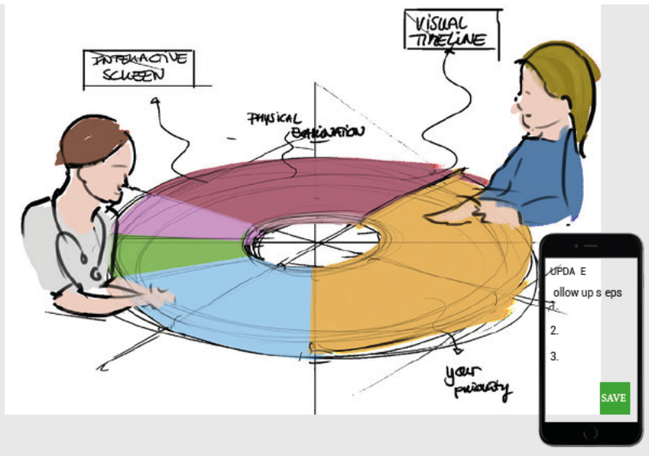
6 Nu je hebt nagedacht over wat je de dokter w vragen, schr f je je hoofdvraag op, bewaar je hem n de porta en stuur je je v aag doo naar de dokter



7 Gebaseerd op de gegeven nformat e geeft de app wee hoe ouw persoon ke t jdsve de ng van het consu t eru t z et Je bent nog n de moge jkhe d om het aan te passen Op het moment dat je het ops aat, wordt je keuze doorgestuurd naar de dokte



8 Het p atform geeft je suggest es van versch ende consu ten te efon sch, v deo ca , on ne vraag ste en of b jvoorbee d een v deo k jken In d t geva s een fys ek consu t nod g en ontvang j j suggest es over hoe j j je consu t kan voorbere den D t kan z jn een fi mpje k jken n de academy, maar d t kan ook z jn het tracken van bepaa de data



T jdens het consu t wordt jouw gepersona seerde t jdsframe gev sua seerd Zowe j j a s de dokter weten de onderwerpen en weten ook hoe ang je hebt om h erover te praten Aan het e nd van het gesprek, maken ju e samen een samenvatt ng en schr jven de fo ow-up steps op n het pat enten porta A s d t gedaan s, s het gesprek k aar

Figure 22: scenario Quality time

H: Concept evaluation

A concept evaluation has taken place to test the desirability of the concept proposal by presenting the project to the patients, specialists, the Erasmus MC and a professor of the value-based healthcare. Besides, the concepts are evaluated towards the selection criteria. The goal is to decide how to continue with this project: which of the elements is the most fruitful to develop further?

H.1 The test set-up

The starting point for all three concepts can be described as follows:

In order to create a conversation where shared understanding is the basis, the patients need to be empowered to make them a more valuable conversation partner. In this way a more personal and efficient conversation can be born, enhancing the real and more in-depth conversation between the patient and the doctor.

Goal:
All three concepts are based upon literature (which is described as 'raison d'etre'), aiming to evoke a more in-depth conversation where patient and doctor understand each other better. The goal of this test is to see whether patients who are for a longer time within the health process experience the effect of *establishing a more in-depth conversation with their doctor,* using these concept proposals.

Method:
All three participants are asked to read the three different scenarios (Appendix G) and give their opinion. The scenarios are based upon a story (storytelling). Besides, they are all asked if they would use such a service and what their biggest benefit was within this service. All three participants are known with the health path for a longer period of time.

Prototypes:
Three scenarios (Appendix G) and two visual representations (figure 23) of the concepts are made based on the disease breast cancer. This test is based on storytelling an approach to measure experiences (Quesenbery & Brooks, 2010).

Question to patients:
- How do you experience this concept?
- Do you think that this conceptsimproves your consultation experience with your specialist?
- What is good about the concept? What is an improvement of the concept?
- Rank the desirability of the concept versus your involvement in the conversation
- What is the added value of this concept, according to you?

Questions to Jan Hazelzet (professor value-based healthcare) and the future doctor:
- What is good about the concept? What is an improvement of the concept?
- Which of the three concepts do you like to be implemented, and why?
- Rank the feasibility of the concept versus the contribution to shared decision making
- Rank the desirability of the concept versus the contribution to shared decision making.

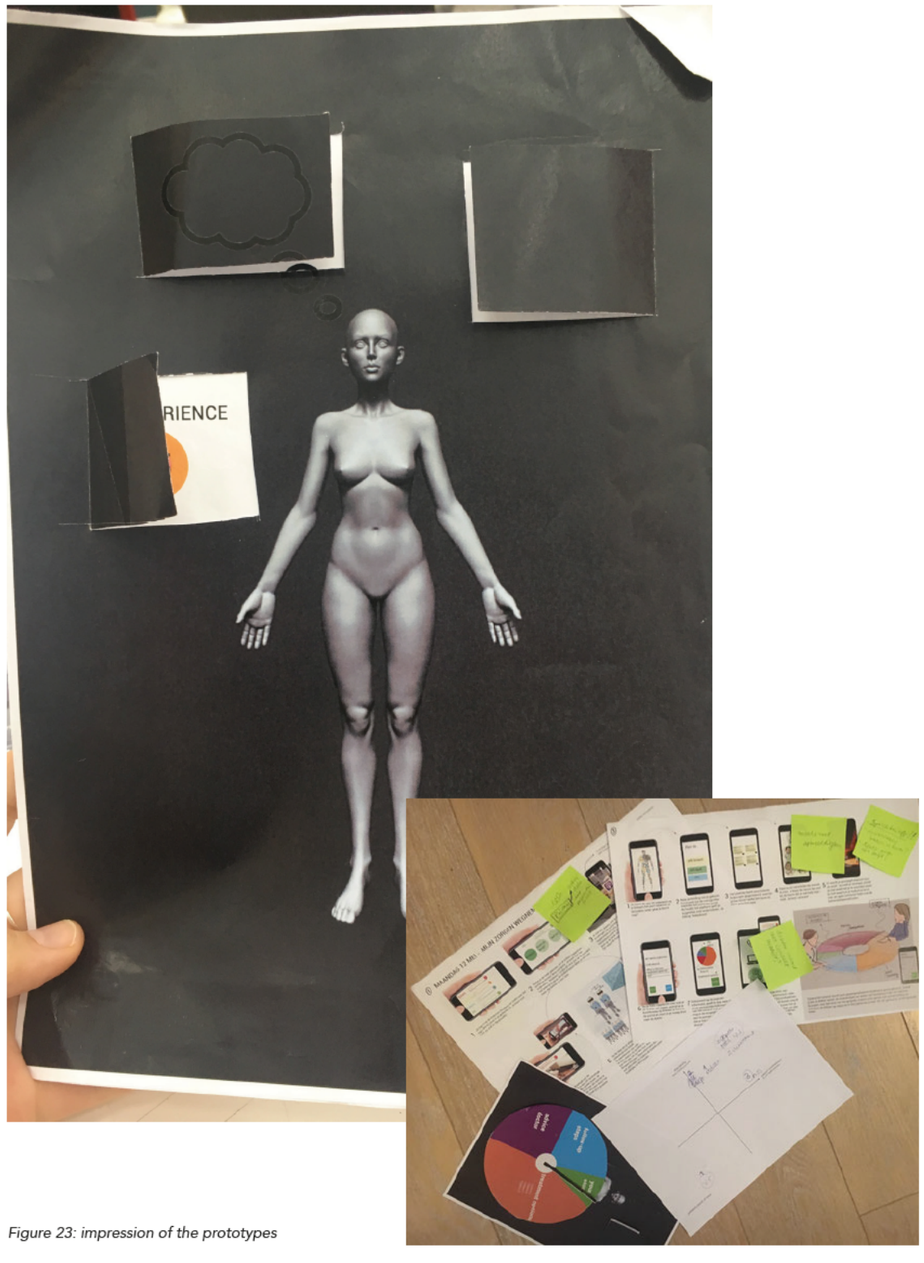


Figure 23: impression of the prototypes

H.2 User test results

The patients were positive about the Erasmus Academy and the Digital Patient I.D. They prefer the personalized information, the digital and physical combinations, and the ownership and control over data and knowledge.

"All three concept create a more-in-depth conversation; as a patient, you know better where you want to talk about. The conversation comes more to the point. I can see that within all three concepts."

Down below the results of concepts are ranked based on desirability and involvement. One patient was not able to rate the concept since the interview has taken place via skype. However, this patient verbally communicated that she preferred the digital patient I.D. concept (blue), the most. The value lies in making mental care more accessible to talk about.

It can be concluded that the Erasmus Academy and the digital patient I.D. are evaluated as highly desirable. They also think that those two concepts increase their involvement in the health process. Quality time is evaluated as undesirable, mainly due to the time limit of the consultation.

" It is a nice idea that the patient does not enter the consultation without knowing their question. You become more an 'owner' of what you want and how the consultation is structured."

" I really like it! It is very personal, and the goal is to give the patient the control."

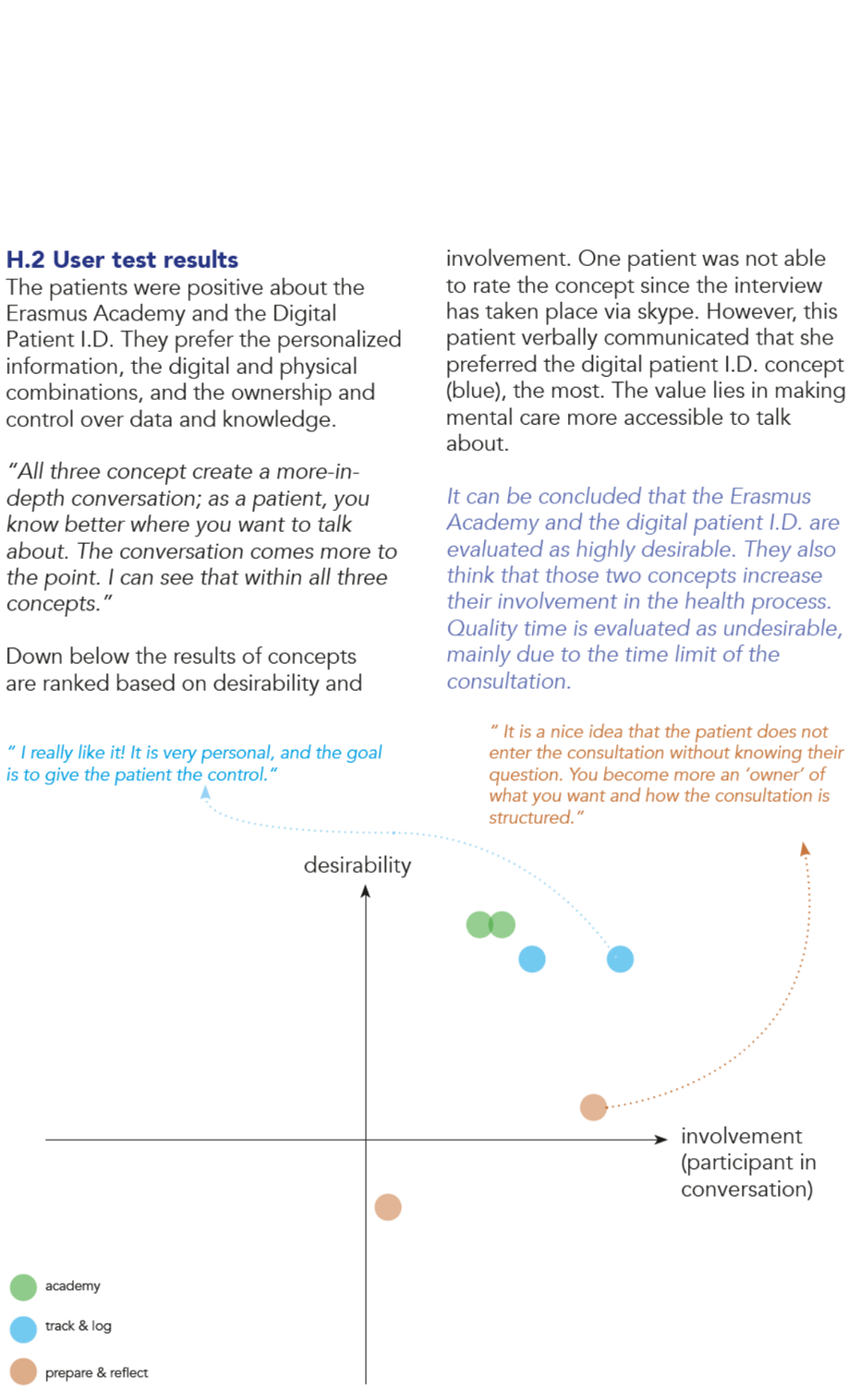


Figure 24: desirability ranking

The results from the specialist side is more scattered. Nevertheless, it can be seen that both the professor of the value-based healthcare and the future doctor ranked the digital patient I.D. as highly desirable.

The Academy is highly desirble according to Jan Hazelzet, since the information is key to having a shared understanding. The future doctor thinks the Academy is undesirable, because as a specialists you need to agree with all the information on the platform.
The reflect and prepare is not that feasible according to Jan Hazelzet, therefore it is not highly desirable. The future doctor thinks this concept brings the patient and the specialists together in an efficient way.

After the evaluation session with the Erasmus MC and the TU Delft, it can be concluded that the Erasmus Academy and the Digital patient I.D. are highly desirable. Quality time is valued as medium desirable.

" You have understood that the patient should be empowered."

" This is the essence of being a specialist: being there for someone."

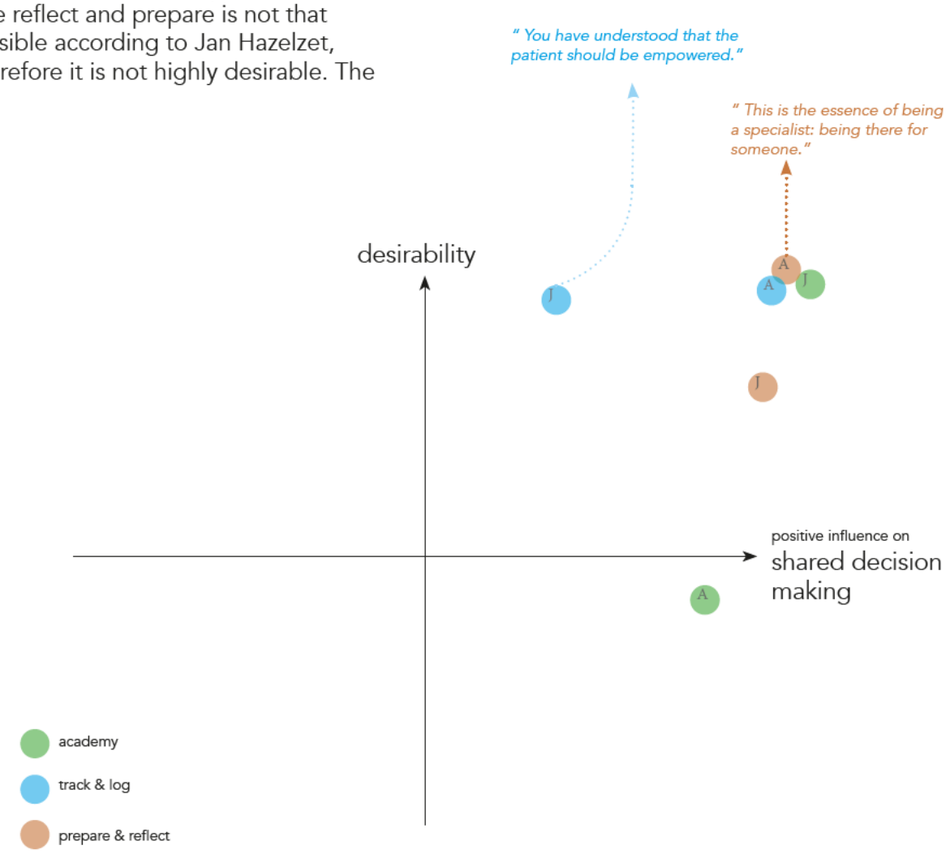


Figure 25: desirability ranking

H.3 Evaluation towards guidelines

The proposed concepts fit the list of requirements (Appendix C). However, the essential requirements to the different stakeholders need to be taken into account when evaluating the different concepts to make a valuable decision. The main stakeholders within this project are the patients, the Erasmus MC (including the specialists) and me as a designer. The essential requirements are formulated as follows:

Erasmus MC
The Erasmus MC is looking for a future proposal for the consultation. The concept should fit the established future vision, focussing on improving the patient experience. The three main requirements are taken into account that focus on the 'sweet spot for innovation'.

Feasibility: the solution is...
- implementable in the year 2030, being in line with the established future vision.
- economically feasible
- applicable to the different departments within the hospital

Desirability: the solution is...
- not taking more valuable time from the doctors than is currently done
- having the right cost/effect balance, searching for the minimal input, maximal output principle
- giving the doctor an insight into the 'head' of the patient

Innovativeness: the solution is...
- new to the Erasmus MC and their doctor's

Patient
The following characteristics are essential to take into account to make the patient a participant within the conversation: patient involvement, companionship and shared understanding.

Patient involvement: the solution is...
- adaptive to the (knowledge) level of the patient giving the patient a level of control over their health information and process by facilitating a safe exploration of information to the patient and increasing the awareness of the patient around their complaint (context, feelings, emotions, treatment options).

Connectedness: the solution is...
- facilitating continuous support along the health traject (peer support/ doctor)
- lowering the barrier to get (on demand) confirmation
- enhancing the physical connection between the patient and the doctor

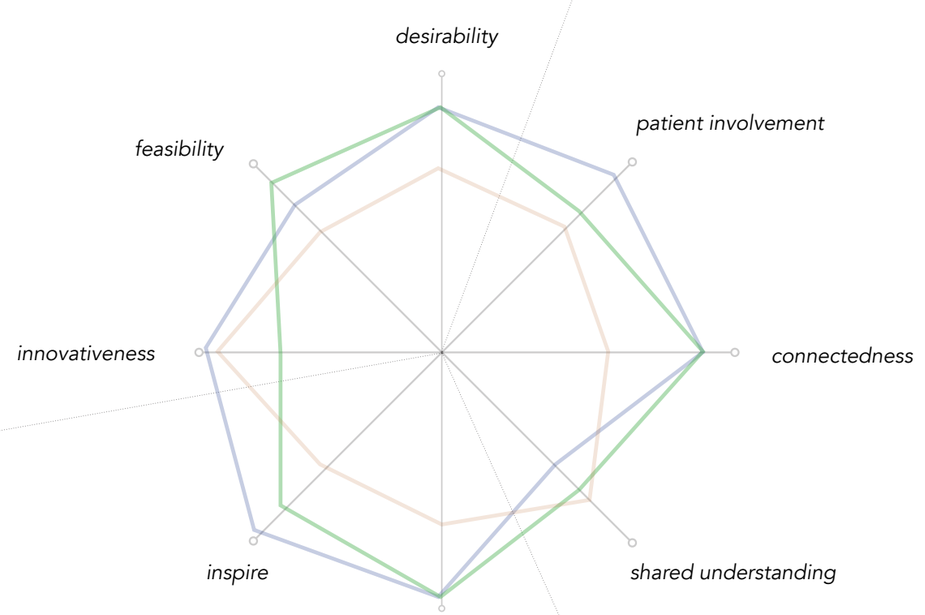
Shared understanding: the solution is...
- creating a medical basis for the patient and the doctor
- encouraging patients think about and communicate their needs, wants and preferences
- facilitating structure and overview during the physical conversation

Me as a designer
To me, as a designer, my learning goal: "a graduation project as a learning traject", is critical to take into account when deciding for a concept. I want to explore new ways and paths within the world of design, and therefore, I have formulated the following characteristics:
- Learning new things: the solution is applicable to fast prototyping and iteration
- is unlikely to be first developed by the Erasmus MC as a hospital, to inspire the Erasmus MC with an unexpected/ unobvious element of the proposal.

The strategy wheel (Delft Design Guide), shows the strengths and weaknesses of each concept concerning the most critical guidelines. It can be seen that the digital patient I.D. (blue) covers most guidelines to the fullest.

Erasmus MC

Patient



Me as a designer

Figure 26: Strategy wheel (Buijs and Valkenburg, 1996)

I: Diabetes

This chapter describes more in depth what diabetes is and how the diabetes consultation looks like. Furthermore, a short scenario is written that shows the impact of diabetes on your life in combination with the consultation.

I.1 What is diabetes type 1?

When the pancreas of the patient does not produce insulin to maintain proper blood sugar levels, the patient has diabetes type 1. Diabetes type 1 is most often diagnosed at a young age.

Insulin is a hormone that regulates blood glucose in the blood. When people are having a meal, carbohydrates are brought down into small sugar molecules which are named: glucose. Insulin enables glucose to enter into the cells so the cells can produce the energy they need to function. From the moment somebody is diagnosed with diabetes type 1, the body does not produce this insulin. Therefore, the blood sugar level needs to be regulated by injecting insulin manually or by a pump.

The diabetes patient measures their blood sugar level several times a day to understand if an insulin injection is necessary. The amount of injections is dependent on the type of insulin, age, lifestyle, job and other diseases (Thuisarts, 2016).

People with diabetes are continuously balancing on a scale, keeping a balance between their glucose level and the amount of insulin. Several elements are influencing the blood glucose level, such as activity (lowers the glucose level) and food (carbohydrates increases the level of glucose and thus the blood sugar level in your blood).

I.2 Hyper and hypo

It is challenging to keep the balance. When having too much glucose in the body, by for example injecting the insulin too late, a patient can get hyperglycemia. The cells do not have enough glucose and the body will start to break down fat and protein; a by-product of this development is ketone bodies. If this happens over a more extended period, it can lead to ketoacidosis (acidification of the blood) (Diabeter).

When having not enough blood glucose in the blood, it is called hypoglycemia. When not recognizing the hypoglycemia on time can refer to having 'hypo-unawareness', which is dangerous since it can lead to fainting and eventually getting into a coma (Diabeter).

I.3 The consultation

Diabetes type 1 patients do not have one specialist they talk to but have four people in their medical team: the internist, the dietist, the medical psychologist and the diabetes nurse. With all four, the patient is exchanging different information. The medical team discusses the information of one patient in a joint meeting.

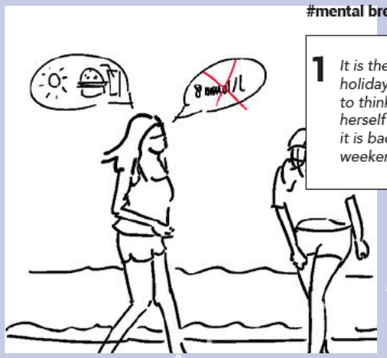
The patient's perspective

Within the consultation, there is not enough time to discuss the mental part of the disease. Within the conversation, the physical results are discussed, which is believed to be not the starting point of the conversation when talking about the future of the consultation (patient 2). Diabetes patients feel judged based on their blood glucose levels while they want to feel being understood. They do understand that diabetes is a very personal disease that is regulated individually, but in this case, the support of the hospital is not always there. An example of the experience of a consultation from the patient's perspective can be seen at the next page (figure 27).

This short research confirms the main findings of this graduation project (see chapter Discover). The following six insights are found for the future of the consultation, specifically for diabetes type 1:

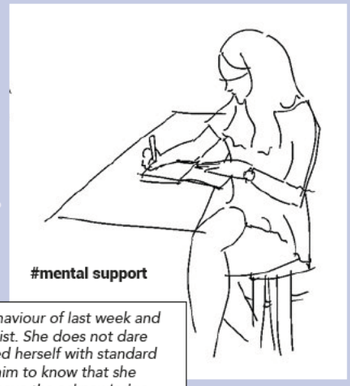
- Diabetes care is not centralized but scattered over four different disciplines which do not support the feeling of connectedness and relatedness. Patients do not want to tell their story over and over again.
- Time is limited to get a personal understanding of the situation of a patient during the consultation (10 minutes). The link between their physical and mental well-being is preferred to be discussed but is often not happening.
- The diabetes nurse is mainly for checking the glucose level, but patients feel that the diabetes nurse could be more on the mental level.
- Patients search for personal advice, based upon their body; data visualization might help with that. Now the advice is always quite general. Patients strive for acknowledgement on the mental effort, instead of on their physical output.
- Patients would like to have the possibility to prioritize the topics of the conversation.

Meet Marie, she is 25 and has had diabetes for more than 7 years. She has tried several things to get a grip on her health situation, but she finds it difficult to find a balance between her daily life and her disease. Often she does not feel understood in the consultation or by her firends.



#mental break

1 *It is the 27th of June and Marie is going on a short holiday with her friends to Texel. She does not want to think about her diabetes and therefore she injects herself with standard amounts of insulin. She knows it is bad, but for now she prioritizes the joy of the weekend above her disease.*



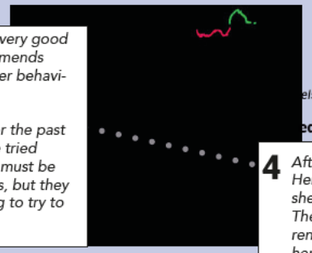
#mental support

2 *Marie feels bad about her behaviour of last week and feels guilt towards her specialist. She does not dare to tell him that she has injected herself with standard amounts, but she does want him to know that she struggles. She would love to have the acknowledgement for her thinking: a mental break is something that she sometimes need. Nevertheless, she wants to be loyal to her treatment plan and therefore she decides to stick to the plan for the upcoming 2 months.*

#relatedness, #acknowledgement

3 *Unfortunately the blood values of Marie are not very good when being in the hospital. The specialist recommends Marie to keep a diary in order to keep track of her behaviour and to get her blood values better.*

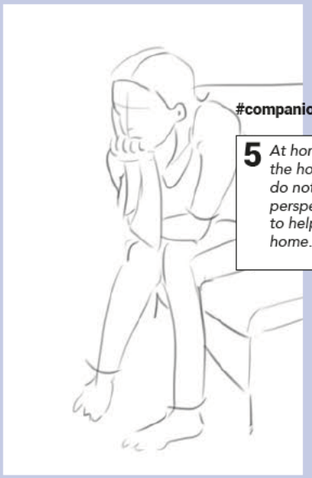
Marie feels disappointed. She did do her best for the past three months... she doesn't feel understood: she tried the diary already and it is not helping her. There must be another reason for not having good blood values, but they do not talk about these possibilities. She is going to try to figure it out herself!



els like a rating instead of a conversation.

edness, #acknowledgement

4 *After a couple of months, Marie comes back at the specialist. Her bloodsugar is quite low, which is positive. Unfortunately she experiences a hypo at the moment of the appointment. The doctor concludes that Marie is in danger of hypo-unawareness and that her bloodsugar is therefore that low. He gives her recommendations of adjusting her insulin intake. Marie thinks the conclusion of the doctor is too fast and would have loved to share her experiences with him, but she isn't able to.*



#companionship #acknowledgement

5 *At home she feels frustrated about the situation in the hospital and tells it to her friends. Her friends do not understand her. They try to change the perspective of Marie and tell her: "they are trying to help you." Marie does not feel understood at home.*

" My mood influences my blood sugar level as well, sometimes it influences it more than when I am eating a sandwich. Now my therapy is only based upon the carbohydrates I eat. "

"I often tell the same story to those people.."

"There are medical psychologists, but my internist has never sent me there because he did not know how I was coping with my diabetes."

 Figure 27: scenario of a diabetes patient

J: Visualisation guidelines

Based on the information gathered within this case study, several requirements are with which the concept must comply.

J.1 Guidelines

The following guidelines should be taken into account:

- There are different types of patients. To serve the different needs and to ensure that patients are not going to worry, the level of visualization should go from abstract to detailed. Depending on the patient communication type, the data can be visualized or explored in-depth, or depending on the level of the conversation: the specialist can get enough abstract information without checking the information in detail.
- A holistic overview should be given of the patient's well-being. At a glance, it needs to be clear to start the conversation from that point. Preferably this visual can be used for the different departments to be a consistent solution that is suitable to the hospital as a whole.
- Patients prefer the doctor to have an immediate overview of their medical and physical state, including their treatment plan. In this way, they hope to unravel a conversation about how they keep up with their treatment plan and how they are coping with it, instead of having a conversation about their physical values.
- The (conversation) priorities of the patient should be clear at the beginning of the conversation so the conversation can steer upon this
- Make use of real data to be trustworthy during the concept test: patients and doctors will focus on the idea behind the concept instead of on the data itself.
- Concerning the typography that supports the visualizations, guidelines are found that are applicable to the iPhone layout. The title should be 17pt, the secondary text 15 pt (lighter font), and captions should be 13 pt (Kennedy, 2018).
- The application should radiate tranquillity and rest by having a harmonious colour coding system

J.2 The role of colour

For this application, the aimed effect is to create a trustworthy, open, and warm digital environment that is an extension of the open and warm conversation with your specialist. The colour balance of this platform should contribute to that feeling.

Currently, mainly the colours blue and green are used within the healthcare environment, since those colours evoke rest, trust, security and responsibility (MarketingTribune, 2014). A study by Drs. Morton Walker, Gerard and Faber Birren have identified that blue has a tranquillizing effect (Hill, 2008).

There is decided to focus on the colour blue as the main colour. This

colour is also a good fit with the logo of the Erasmus MC. The blue will be complemented with bright colours that represent the patient data (*"colours previously considered "too bright for health care settings," such as vibrant golds, citrus greens, crimsons, and Caribbean blues, are now thought to be vital therapeutic tools that directly promote healing"*) (Hill, 2008)

With the help of adobe colour tool, the harmonious colour scheme in figure 29 is chosen (Adobe Color). For the font style has been chosen either one of those colours or white. White is working very well with the colour blue, as being proven by the weather app of Apple (figure 28).

There are several rules for colour harmony, and within this set of colour, the colours are 'composed', since some brighter blue colours are within this colour scheme (figure 29).

Figure 28: Apple weather app

Figure 29: colour coding (image source: adobe color)

K: Iterations

This chapter shows the different iterations that have lead to the final concept. The iterations are continuously evaluated with specialists, patients and the TU Delft.

1

First iteration

Using the human body as the starting point might be confusing. What if you want to see the mental information of the patient? Do you click on the head or the heart? And what if somebody has a brain tumour? Patients indicated that this option was too realistic to them, which can be scary.

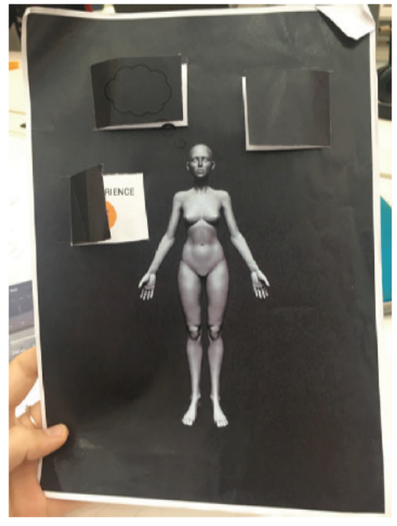


Figure 30: first iteration

2

Figure 31: second iteration

Second iteration

Using different tabs for information concerning your physical well-being, mental well-being and perspective. This division is received positively by diabetes patient. They would like to add an option that indicates the effort they put into it.
Furthermore, the patients miss the management of the disease. What is the effect of those different tabs on eachother?

3

Third iteration

Using the different tabs, including the management of the disease. Together with doctor Ozcan is evaluated what specialists want to see in such an intervention (diëtist, medical psychologist, diabetes nurse and specialist)

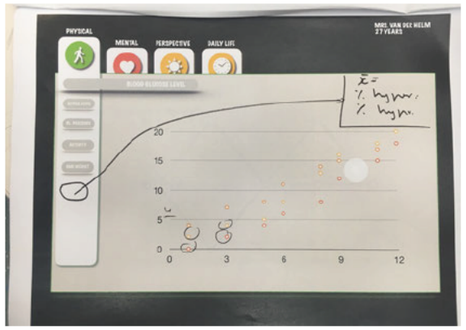
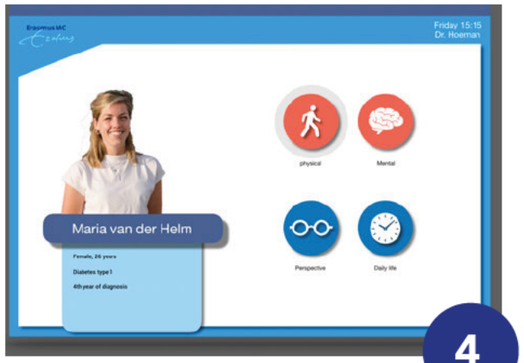


Figure 32: third iteration



4

Figure 33: fourth iteration

Fourth iteration

Using the main screen for giving a summary of how the patient is doing. The colour indicates how the patient is doing on the different elements. The advice for this iteration was to come-up with a visual that summarizes all this information at one glance.

5

Fifth iteration

This proposal uses one visualization to show how the patient is doing mentally and physically. The outer-circle represents the treatment plan, and the circle represents the patient's behaviour towards it. If the circle is broad - so close to the treatment plan, the patient is physically doing well. If the circle is colour green, the patient is mentally doing well. The information of how this is established can be found behind the circle. According to the diabetes patient, this is valuable to use when talking to your diabetes nurse.

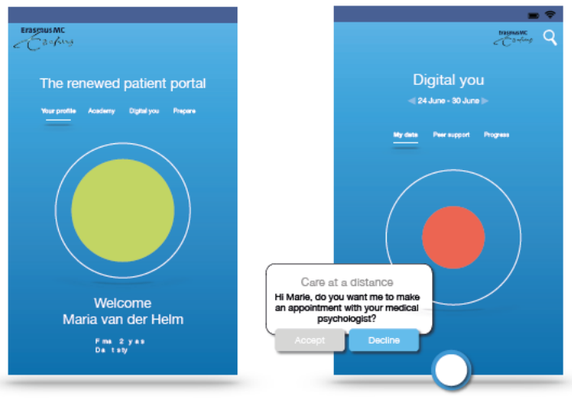


Figure 34: fifth iteration

L: Elements

This chapter shows the whole structure of the platform, including the explanation of the different screens.

L.1 The structure

The structural data framework (Chapter 5.3.4) is the basis of the structure. Within the next pages the screens are explained in depth.

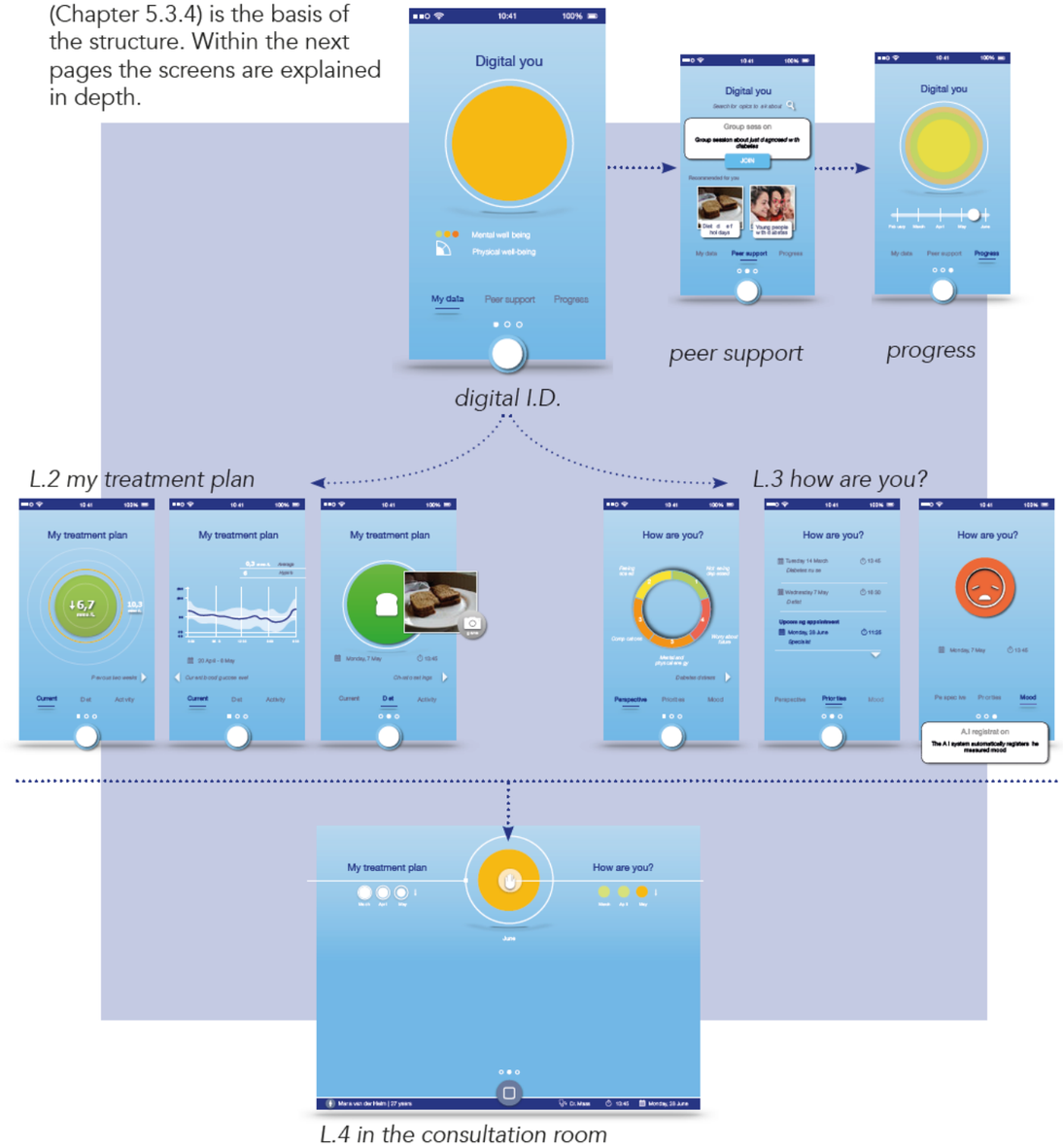


Figure 35: structural overview of the screens

L.2 My treatment plan

The most critical information to the user is about their diabetes control. The user can see their current blood sugar level (6,7 mmol/L) in relation to their average blood sugar level (10,3 mmol/L). The colour of the circle indicates that the current blood glucose level is OK, and the arrow shows that the blood sugar level is going down.

The user can navigate to a two-weekly update to see an overview of their blood sugar levels (figure 36). Again the average blood sugar level can be seen, including the lowest blood sugar level and the amount of hypo's that occurred.

Furthermore, the user can explore the influencing factors on their blood glucose level: diet and their activity.

A future possibility could be to link a carbohydrate calculation to the platform. By making a photo of the meal, the system can automatically calculate the amount of insulin the user needs. A patient can easily keep track of their diet and on their insulin intake, while it is saved in their portal - all in one! Lastly, it is preferred to save the insulin/ carbohydrate settings to remember them over some time (Diabetes patient interview).

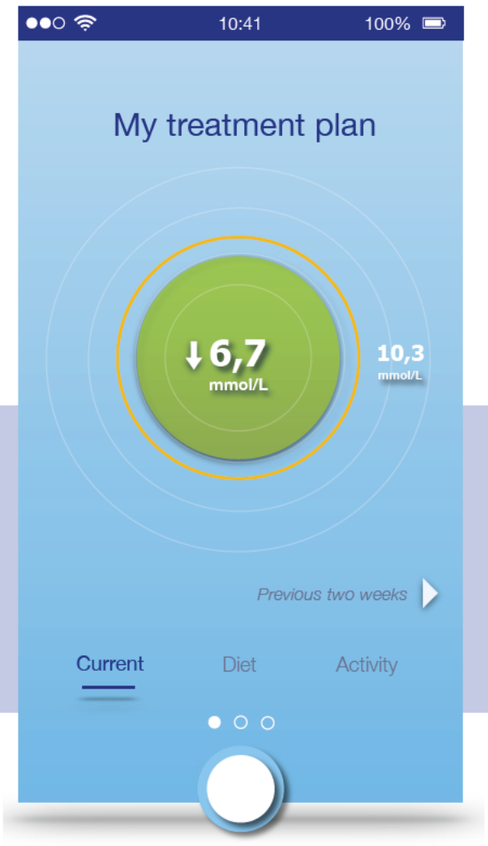


Figure 36: the blood sugar level

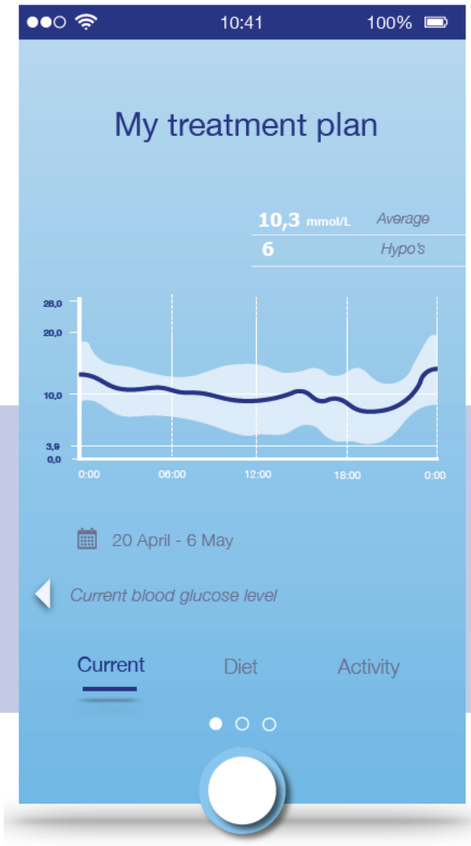


Figure 36: progress over some time

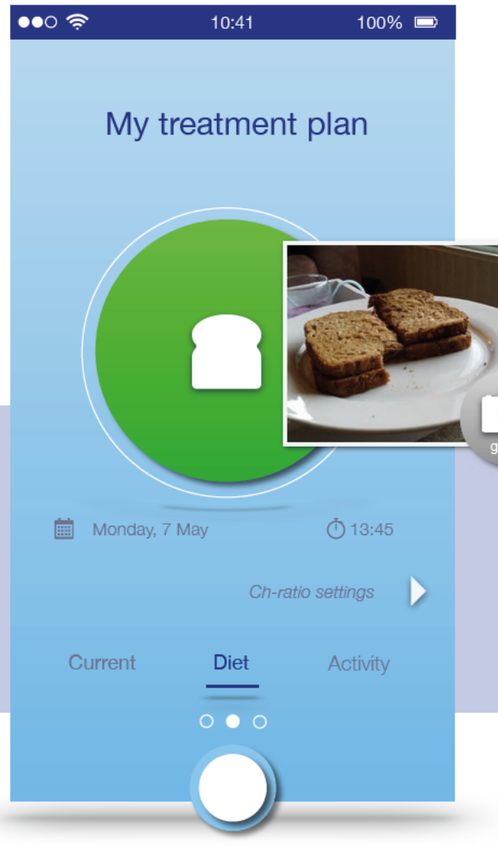


Figure 37: diet support

Besides the diabetes control data, the intermediate outcomes are linked to this profile (blood pressure (diastolic, systolic), cholesterol and triglycerides, BMI weight, BMI height, waist circumference) (see structural data framework), but this data is not visualized within the scope of this project.

L.3 How are you?

Within the diabetes care there are three questionnaires that indicate the mental well-being of the patient. The user is able to see their results of the diabetes distress questionnaires (WHO-5, PHQ-9 and PAID-5). The diabetes distress is the questionnaire that pops-up first when navigating to the 'How are you section'. The visual shows the five elements from the PAID 5. Within this visual the negative and positive elements are highlighted. It can easily be seen that this patient has concerns about the future, the complications and the mental and physical energy it takes from them. This insight will allow the patient to have a moment of reflection before going to the consultation.

This insight will help the patient to indicate their priorities of the conversation based upon their improved self-knowledge (figure 39). The priorities will be saved, in order to look back at the priorities of other conversation, but also to give the patient a cheat sheet during the conversation. Communicate your priorities to the conversation can be done in the same way as a tweet (@ Twitter).

Lastly, the mood of the user will appear. In the future, A.I systems are better in recognizing emotions than your own family (Kleber, 2018), In 2030 there will be ways for measuring the mood automatically. An example is shown where the A.I. has identifies the mood of the patient at a moment in time. By linking your agenda and events to the moodscanner, the A.I system creates insights in the moodswings in relation to the diabetes.

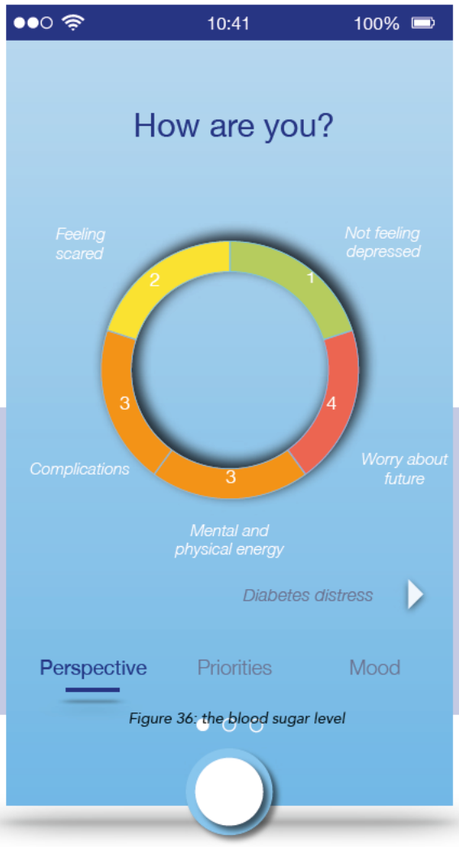


Figure 36: the blood sugar level

Figure 38: diabetes distress

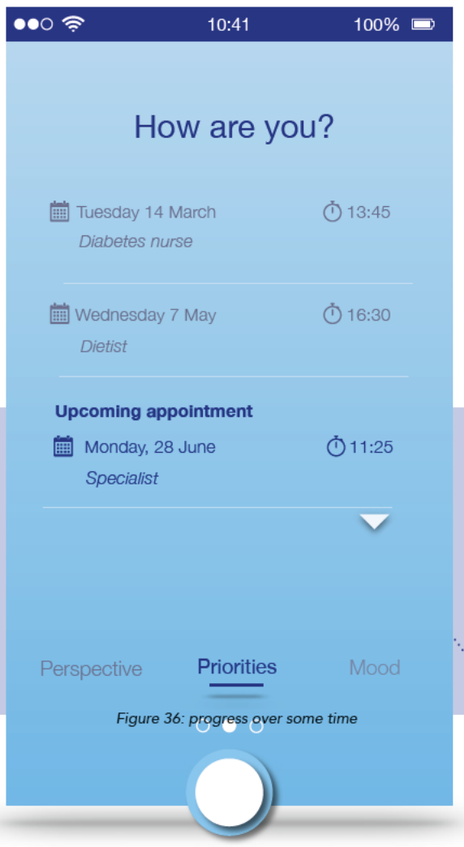


Figure 36: progress over some time

Figure 39: priorities

140 punctuaction marks is the maximum and by adding a # or a @ the user can refer to different topics within the platform. For example: #diet.

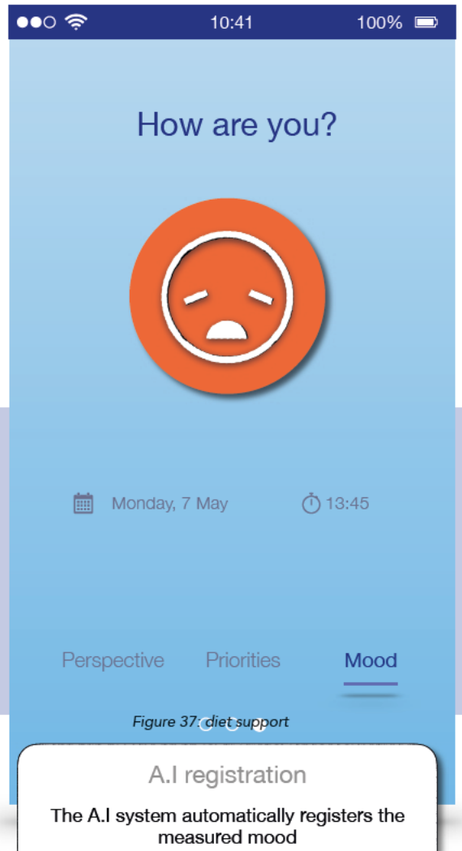


Figure 37: diet support

Figure 40: mood scanner

Besides the diabetes distress, also the well-being and depression questionnaire should be taken into account to cover the whole mental spectrum of the patient. Within this graduation project the visualization of those two questionnaire is out of scope.

L.4 The interactive screen

The health data is linked to the portal of the Erasmus MC, therefore, the health data can be used as a conversation starter within the consultation. This data creates a better understanding of the perspective of the patient.

The patient will recognize the information and is familiar with the data shown: it gives the patient a feeling of security: 'the doctor can make a decision based upon the health data' and 'the doctor knows my medical history'.
On the other hand, the digital patient profile gives the specialist an overview at a glance of the patient's physical and mental state, including their treatment adherence. All specialists are up to date of the wellbeing of the patient, independent of their specialism. In this way, the patient is treated holistically by all the different specialists. The intervention is also able to indicate the most likely reason for coming (figure 40)

The main screen
The interactive screen in the consultation room has the same structure as the platform of the patient. The patient is not surprised by the information shown and is familiar with the navigation through the data. By clicking on the outer white circle or on 'Your treatment plan' the patient and specialist will navigate to the physical wellbeing part (figure 41). By clicking on the orange circle or on 'How are you?' the patient and specialist will navigate to the mental wellbeing part (figure 42 and 43).

At the bottom, the main screen shows the link to the patient details, the consultation time, the doctor and the date. By clicking on the home button, the specialist will always navigate to the homepage. By clicking on the icon of a human, the specialist will navigate to the profile of Marie.

The *My treatment plan* and the *How are you?* are showing the same information as the platform of the user.

My treatment plan
By clicking on my treatment plan, the diabetes control of the patient will appear. It shows an overview of the blood glucose levels of the patient, including the average, the minimum and maximum blood glucose level (figure 41). Furthermore, the specialist can navigate to the history of the patient by clicking on the Hba1c level of the patient. The Hba1c level of the patient immediately shows the development of the patient over time. The specialist is also able to have a look into the diet and activity of the patient.

How are you?
This screen gives immediately an overview of the diabetes management of the patient. It shows how the patient is doing on the five important elements of diabetes distress (figure 43). When preferred, the specialist can also navigate to the results of the other two questionnaires of the ICHOM (Well-being and Depression). The colour and the number indicate how the patient has scored at a certain topic. The specialist can also navigate to the other elements that can be discussed: priorities and mood. Within the priority tab, the specialist can see which topics the patients want to discuss. The mood tab shows how the mood of a patient has fluctuated over a period of time, in relation to important events in the life of the patient (figure 42). These events are shown based upon the agenda of the patient. If the patient does not link his agenda to the platform, this information can not be visualized.

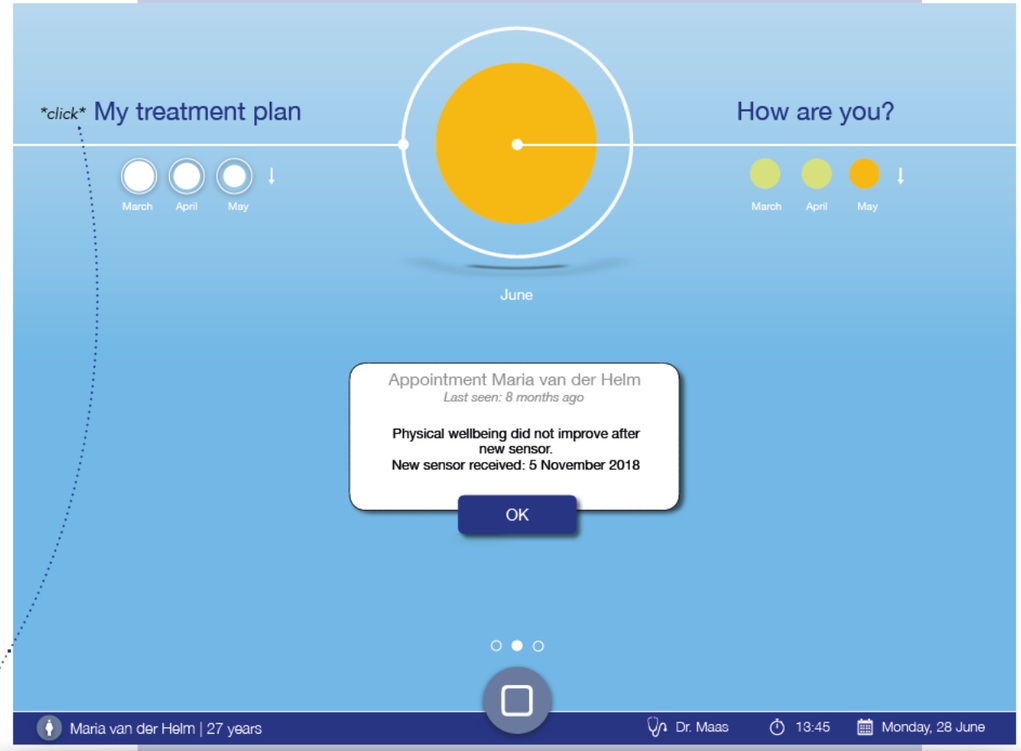


Figure 40: The main screen

Figure 41: My treatment plan

Figure 42: My mood

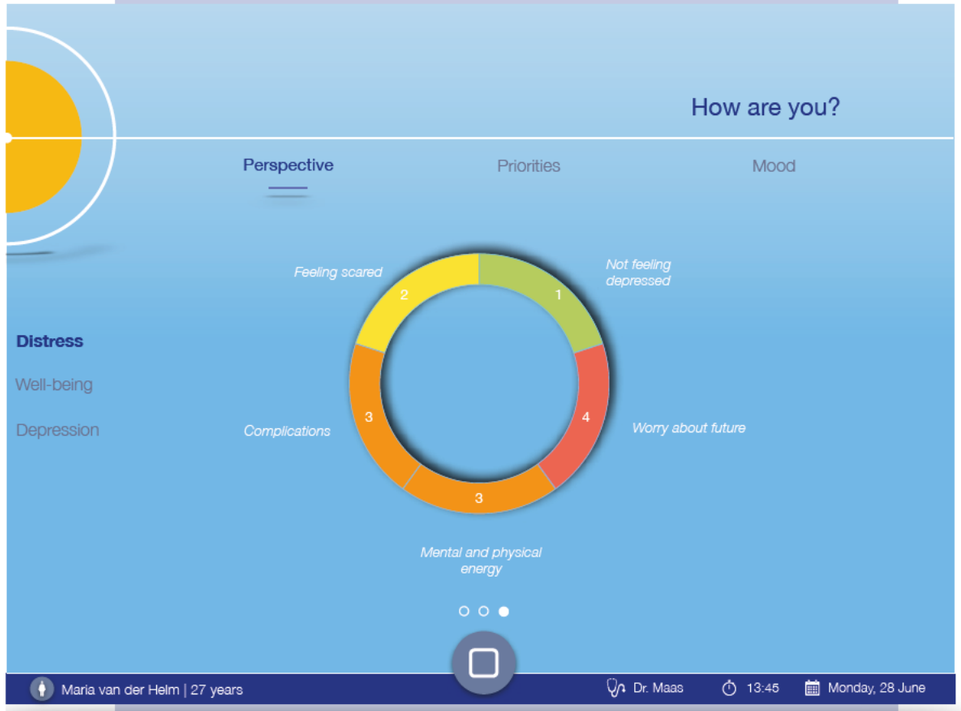


Figure 43: My perspective

M: Validation test

A first test is carried out to validate the desirability of the concept proposal by presenting the project to the patients and specialists. Besides, the concept proposal is evaluated towards the barriers that are found in the analysis (See DISCOVER).

M.1 Goal

The main question to answer is:
Are the barriers for having a positive patient experience solved to establish a more in-depth and more empathic conversation (the aimed long term effect)?

The validation is divided into three main themes, to answer the main question:

- *The usability of the proposed platform:* do the users understand how they should navigate through the platform? Is the visualisation clear to the users?
- *The effect of the intervention on the patient*: does the digital patient profile support a better patient experience? In other words: does it solve the barriers (Chapter 2.4)?
- *The effect of the intervention on the medical team:* does the digital patient profile support a deeper layer in the conversation?

The digital patient profile aims to bring a deeper level in the conversation back between the patient and the specialists. Due to regulations and the time frame of this project, it is not possible to test this long term effect in the actual context of a consultation. Therefore the patients and the specialists are asked to what extent they think the concept proposal would benefit a deeper level in the conversation, and if it evokes a better patient experience.

M.2 Participants

Four patients with diabetes and nine specialists with different roles within the medical team (specialists, medical psychologists, diabetes nurses and dietists) are asked to give their opinion. The patients are asked to provide their opinion in a 1 to 1 interview, and the specialists are asked to provide their opinion in a 45-minute plenary session.

M.3 Approach and method

The validation has the form of a qualitative user study, following a semi-structured interview approach. The designer has chosen for this approach to understand the possible effect of the intervention better.

The designer will explain the concept briefly to the participants, using visualizations that can be found in Chapter DELIVER. The working principle of the platform is presented in a short presentation to the participants. Secondly, the scenario is told and shown by the designer, aiming to evoke the experience of using the proposal. Using a scenario will allow the participants to place the intervention in the actual context, which will stimulate them to imagine the situation of using the concept proposal without focussing on the details too much (Quesenbery & Brooks, 2010). Making use of this scenario is called low-fidelity prototyping (Mobgen, 2017).

In this way, the designer hopes to stimulate the imagination of the patients and specialists, so they can explain how they think the proposal affects their future consultation. Since the availability is different for the patients and the specialists, the test set up is slightly different for both groups. After presenting the scenario, the designer will start the semi-structured interview (patient group) or the statement voting and discussion (specialist group).

Patients
The patients are asked to fill in a short questionnaire to discover the (possible) effect of the intervention on their patient experience in comparison with the current situation.The survey consists of six statements, to which the patient can answer with 1 (fully disagree) to 5 (fully agree). The statements are one-on-one translations of the barriers that are found in the analysis.

Statement 1 participant:
When using this intervention, I feel more empowered in the conversation.

Statement 2 vacuum:
When using this intervention, I feel that I am in control of my health data.

Statement 3 alone:
This intervention makes me feel more continuously cared for.

Statement 4 confirmer:
This intervention helps me to get insight into my health situation more easily.

Statement 5 disabler:
This intervention creates a more in-depth and more empathic conversation between the specialist and me.

Statement 6:
I find the visualization of the digital patient intuitive to use.

Statement 7:
I want to use this intervention in the future.

- What do you think of the visualization of your patient data? Why?
- Do you think this intervention helps you to communicate better with your internist? Why?
- What do you feel about sharing your data with the hospital to get better care? Why?
- Do you want to use this intervention in the year 2030? And why (not)?
- What would you adjust to the intervention if you have the possibility?
- Do you have any other comments?

Specialists
Since nine specialists are participating in the plenary session, the semi-structured interview questions are eliminated.

The specialists are asked to fill in a short questionnaire to discover the (possible) effect of the intervention on the depth of the conversation. The survey consists out of six statements, to which the specialists can answer with 1 (fully disagree) to 5 (fully agree). The statements are presented on a screen after which the specialists can vote on a voting paper that they received. This approach continues after all six statements are answered. The statements are one-on-one translations of the barriers that are found in the analysis. The explanation of their vote is used to explain the survey outcome.

Statement 1 participant:
I find that this intervention contributes to a better understanding of the patient's perspective.

Statement 2 vacuum:
I find that this intervention supports me in giving structure to the conversation.

Statement 3 alone:
I find that this intervention allows me to be a more involved doctor.
Involved = knowing and understanding the patient's situation

Statement 4 confirmer:
I find that this intervention allows me to support the patient in their health traject better.

Statement 5 administration:
I find that this intervention makes the conversation broader: it supports a holistic patient approach

Statement 6 disabler:
This intervention creates a more in-depth and more empathic conversation between the patient and me.

Statement 7:
I find the visualization of the digital patient intuitive to use.

Statement 8:
I want to use this intervention in the future.

Question: If you have the chance to change something to the design, it would be...

All sessions are audiorecorded and the comments are clustered and summarized.

M.4 Material needed:

- The elements of the concept on paper (a3) to explain the concept
- The scenario drawn and written. The scenario is shown via a laptop.
- Google survey

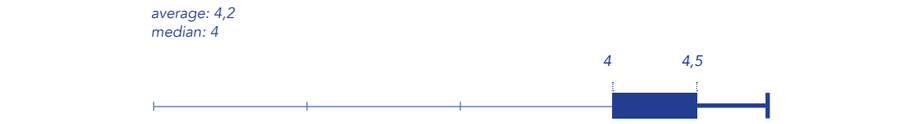
M.5 Limitations

- As already stated, the intervention is not tested in the desired context due to time limits and regulations.
- The designer translated the barriers into the statements. Therefore, the translation is biased by the opinion of the designer. For example, statement 5 could have been formulated as: "this approach lowers the administration load", while the designer has chosen to go a level deeper by enhancing the possibilities of having less administrative work. The statement focusses on having more time for the patient as a whole, instead of having the time to only focus on the physical part.
- The interviewed patients are all female and high educated
- The presentation of the concept proposal did not show all the ins-and-outs of the concept. The presentation could have influenced the opinion of the specialists and patients.

M.6 Results specialists

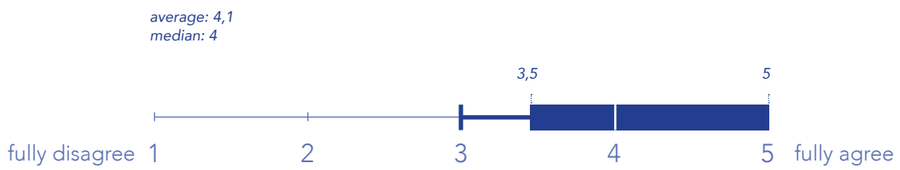
The results of the degree of 'turning the barrier around' are visualized in the form of a boxplot. Within the boxplot the minimum vote, the maximum vote, the median, the average and the IQR (the range where the "weight" of the value lies). The IQR is indicated with the purple box. The results of the specialists are shown on the next page.

Statement 1 participant:
I find that this intervention contributes to a better understanding of the patient's perspective.



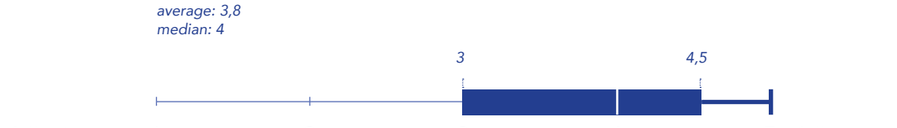
Specialist find it useful to get an insight in the mental state of the patient supported with data. They also believe that it gives the patient more autonomy in their healthprocess by supporting the patient's self-management.

Statement 2 vacuum:
I find that this intervention supports me in giving structure to the conversation.



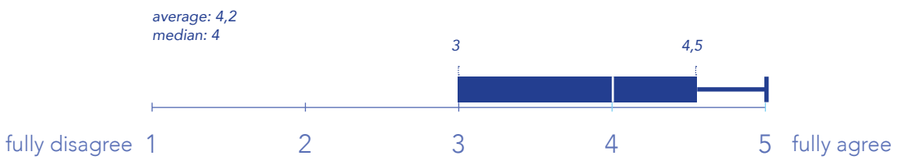
The information is centralized in one system, which gives them an accurate overview of why a patients comes to the hospital (where lies the problem of the patient?). Both the dieticians were not that positive because they worried that the conversation becomes too structured. They did not know if this was benefical or unfavorable in the consultation.

Statement 3 alone:
I find that this intervention allows me to be a more involved doctor.



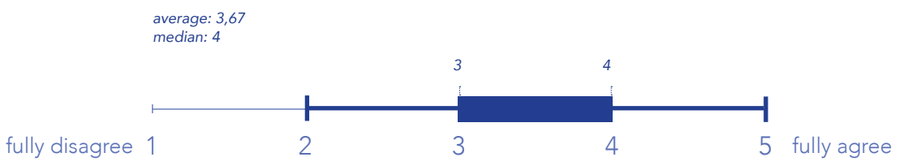
Specialists think that it helps the patient to become more involved, instead of being more involved as a specialists. This higher patient involvement will help them to strenghten the collaboration and interaction during the consultation. However, they find that this tool changes their perspective of following a certain list. They feel that this intervention steers the conversation into the right direction.

Statement 4 confirmer:
I find that this intervention allows me to support the patient in their health traject better.



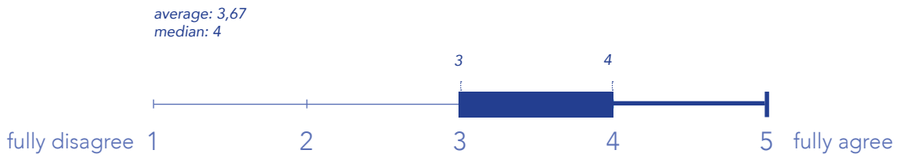
The specialists believe it supports the patient better because patients will come to the hospital when they are in need of care and due to monitoring they can receive care at a distance. Besides, the data provides a better preparation and will help to see trends in the data to establish concrete goals.

Statement 5 administration:
I find that this intervention makes the conversation broader: it supports a holistic patient approach



The tool allows the specialists to spend their time at the more important tasks. They see that it is a try to the holistic patient image. Only physical and mental was too ‘abstract’ it is about more. The specialists still miss some data in the proposal, such as diet advice and elements from the positive health institute (Huber).

Statement 6 disabler:
This intervention makes the physical conversation between me and the patient deeper and more empathic.



Specialist find that this supportes a guided consultation that makes the conversation more equal. Patients come to the hospital when it is necessary, and therefore the specialists can give care at the moment it is mostly needed.

Statement 7:
I find the visualization of the digital patient intuitive to use.

The visualization of the patient data is intuitive to use. They think they need to get used to ‘reading’ the image, but in the end it wil save them time in the consultation. They find the working principle logical. It is recommended to have a look at colour blindness since not everybody was able to differentiate the colours.

Statement 8:
I want to use this intervention in the future.

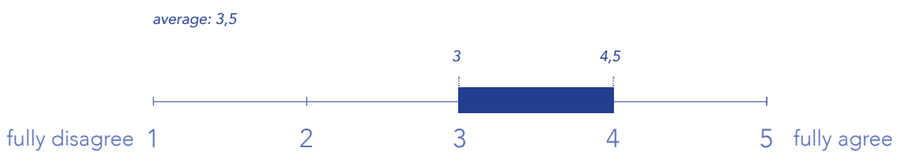
All specialists want to use this intervention in the future:
- They believe that this tool illustrates where the future goes to. The visual aspect of the concept is good.
- They believe it helps to steer the conversation into the right direction
- It opens up possibilities for patients to indicate that they do not feel well and talk about it. This is a good addition to the consultation: the mental part, the values and preferences is shown more clearly.

Also some remarks are made in relation to the concept proposal:
- The specialist prefer the tool to be more extensive. It should include a wider range of data and questionnaire: such as activity, treatment goals.
- When more data is involved, the data need to be filtered in a way that it becomes ‘handable for us’.
- Every patient should be ‘motivated’ to use a tool like this, and not only the wizzkidz. Specialists seet his as the biggest challenge. People need to get some guidance to use a tool like this.
- What if the data that is measured or filled in by the patient is not right? What if they find a way to give a socially desirable answer.

M.7 Results patients

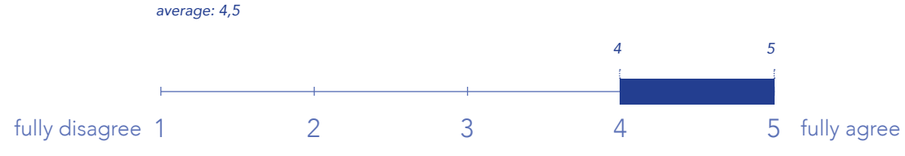
The results of the degree of 'turning the barrier around' are visualized on a 1- 5 scale. Because there are just 4 participants interviewed, only the average and the range are visualized.

Statement 1 participant:
When using this intervention, I feel more empowered in the conversation.



The participants feel more empowered in the conversation. They say that the data can support them in communicating how they feel. Furthermore they think the data can help the specialists to take the emotional side more into account. They expect that the specialists will understand them better. Lastly, they expect that the whole care team can communicate better with them since the information is shared within one platform. One participant feels already very empowered during the consultation, and therefore she indicated the effect with a 3.

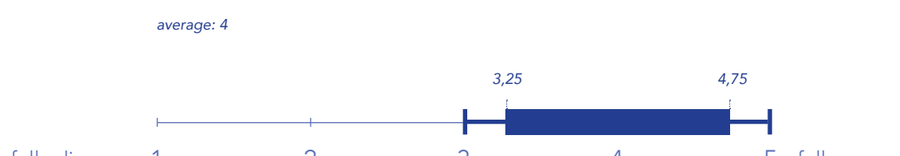
Statement 2 vacuum:
When using this intervention, I feel that I am in control of my health data.



The participants feel more in control of their health data. Currently, the participants have found ways to 'ignore' their health data, but this platform makes this almost impossible. They do think that the data can be confronting, but they do believe that this confrontation is necessary for regulating diabetes optimally. Furthermore, the participate question the trust in technology: how accurate is an A.I. system in defining how you are feeling? Although this doubt, they do think that this is where the future goes to. It is a matter of getting used to being tracked.

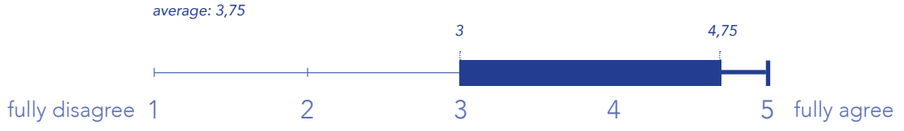
Currently, it is possible to deny diabetes. With this intervention, you will be continuously confronted with your health data. I think that this confrontation is necessary to regulate diabetes optimally.

Statement 3 alone:
This intervention makes me feel more continuously cared for.



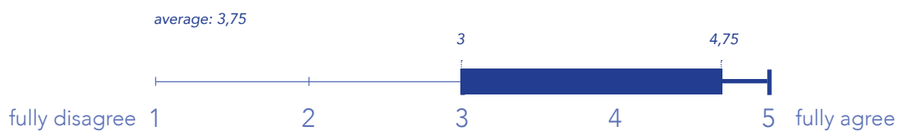
The participants believe that tracking and logging the information can create a more continous experience, since all specialists can built upon eachother's information. When you are not feeling well, you feel supported as the hospital sends you a message for an appointment. They question how an automated message of your internist creates a personal feeling in comparision with getting a telephone call.

Statement 4 confirmer:
This intervention helps me to get insight into my health situation more easily.



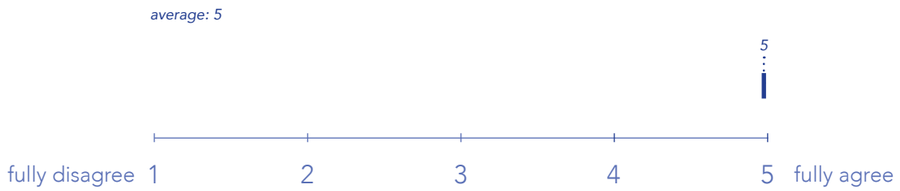
The participants find it comfortable that all data is linked within one platform; this gives them an accurate overview. Seeing the progress of your data is very insightful. It provides more information about how you felt in a certain period, which can give you valuable information on how to act towards diabetes.

Statement 5 disabler:
This intervention makes the physical conversation with my specialist deeper and more empathic.



The participants think that the intervention helps them in communicating how they feel about their diabetes better. They hope that this intervention results into a conversation that links their physical data to the mental data; this is what they value. Furthermore, patients think this intervention could oppose a more empathic conversation when the specialist does not mention anything about their mental state.

Statement 6:
I find the visualization of the digital patient intuitive to use.



All participants find the intervention intuitive to use. They understand how to navigate through the data. Besides, they find the visualization of their data clearly. They mention that it would be more comfortable if the visualization is not immediately visible at the main screen. They think that this can be to confronting when you are not doing well.

Statement 7:
I want to use this intervention in the future.

All participants would like to use this intervention in the future. To give an indication of the benefits, several quotes are listed below:

" I like the idea of peer support: those people will understand me much better than my friends. It is easy and accessible. "

" It feels comfortable when your specialists sents you an invitation for an appointment, then you do not feel alone. It feels supportive when the hospital sents you the message."

" I would give me much trust when this intervention results in a conversation about the link between your physical and mental data. I want to talk about this link, but currently, this is not happening."

" The data can help you giving insight into how you were physically and mentally doing in a certain period. The focus of the conversation can become your progress over some time. "

0: Project brief

Within this appendix the initial project brief is shown. This project brief describes the start of this graduation project.

TU Delft

DESIGN FOR our future

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format: IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy .
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name
initials — given name
student number
street & no.
zipcode & city
country
phone
email

Your master programme (only select the options that apply to you):
IDE master(s): IPD / DIT / SPD
2nd non-IDE master:
individual programme: (give date of approval)
honours programme: Honours Programme Master
specialisation / annotation: Medisign / Tech. in Sustainable Design / Entrepreneurship

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Prof. dr. Ir. Goossens, R.H.M. — dept. / section: Applied Ergonomics an
** mentor: Ir. Kroon, C.P.J.M. — dept. / section: Product Architecture D
2nd mentor: Stephanie Klein-Nagelvoort (Erasmus MC)
organisation: Erasmus MC
city: Rotterdam — country: Netherlands
comments (optional):

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..
Second mentor only applies in case the assignment is hosted by an external organisation.
Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

TU Delft

Procedural Checks - IDE Master Graduation

APPROVAL PROJECT BRIEF
To be filled in by the chair of the supervisory team.

chair: Prof. dr. Ir. Goossens, R.H.M. — date: - - — signature:

CHECK STUDY PROGRESS
To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: EC
Of which, taking the conditional requirements into account, can be part of the exam programme: EC
List of electives obtained before the third semester without approval of the BoE:

YES — all 1st year master courses passed
NO — missing 1st year master courses are:

name — date — signature

FORMAL APPROVAL GRADUATION PROJECT
To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, disapprove and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc) programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment?

Content: APPROVED / NOT APPROVED
Procedure: APPROVED / NOT APPROVED
comments

name — date — signature

The consultation of 2030 — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date: 15 - 03 - 2019 — end date: 20 - 09 - 2019

INTRODUCTION **
Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money, ...), technology, ...)

This project is in collaboration with the TU Delft and the Erasmus MC. It is about the consulting room of 2030, the room where the doctor and the patient meet eachother. The main activity within this room is the actual consultation, the moment of interaction between the doctor and the patient.

The healthcare sector:
The healthcare is making a transition from the 'fee-for-service' to a 'value-based' model (Porter, 2014). This means that the experiences which matter to the patient have become one of the parameters to measure the hospitals success, rather than the amount of treatments. The patient experience becomes more important to hospitals in the future.

Erasmus MC:
The Erasmus MC introduces this value-based healthcare model as the quality standard and goes for a more holistic approach: 'Care does not stop at the hospital anymore' (Hazelzet, 2018). In line with this new strategy, the Erasmus MC introduced questionnaires (+-100 questions) to improve the patient experience during the treatment (value based healthcare Erasmus MC, 2017).

Unfortunately, the situation within the consulting room is not in line with the new value-based strategy yet. The computer is the only innovation within years in the consulting room, but it is often the jamming agent of the communication between the doctor and the patient. This is not beneficial for the patient experience. There is a huge opportunity to improve the patient experience during a consultation.

The consulting room:
The main activity in the consulting room is the information exchange between the doctor and the patient: there is an interaction. As already been said, there is often not a smooth communication between the doctor and the patient as the computer is in the way of the communication. Often, the patient does not remember everything what has been said after leaving the hospital. In the future of this context, shared decision making becomes more important for the doctor and the patient. The doctor can guarantee the best health path for the patient and the patient has the feeling of being in control (McKay, 2018).

see figure 1, step 1 and 2

space available for images / figures on next page

introduction (continued): space for images

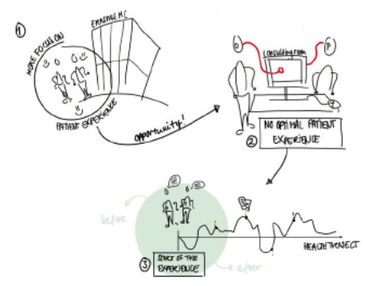


image / figure 1: the context and scope of the project (scope is in green)

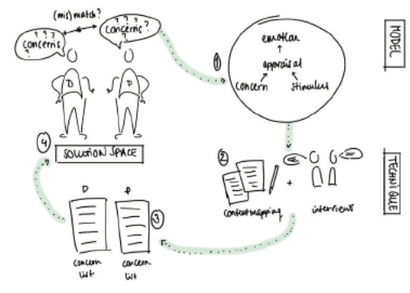


image / figure 2: solution space (method + approach for user research)

Personal Project Brief - IDE Master Graduation

TU Delft

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Scope (see figure 1, step 3):
To improve the overall patient experience for the Erasmus MC. I want to focus on the patient experience before, during and after the consultation, and not only during the treatment. The patient experience starts at the moment the patient comes for the first time to the hospital, so the information exchange between the patient and doctor is very important (and it will stay important throughout the whole health path).

Solution space (see figure 2):
The solution space for this project is found at the point where there is a match or a mismatch between the most important concerns of the patient in relation to the most important concerns of the doctor before, during and after a consult. These outcomes are used in combination with an overview of how the health path looks like nowadays and how it looks like in the envisioned future (creative session).

Approach & methods (see figure 2):
People find it difficult to retrieve and formulate their real needs and values. Most of the time, people don't know what they really want and need (Pieter Desmet, 2018). People are better at expressing their emotions, and luckily there hides a concern behind every emotion. I want to use contextmapping and indepth interview to discover these concerns. Next to this user study, desktop research is conducted to create a deeper understanding of the current context, the value-based model (business) and the technological possibilities which can support the context in the year 2030 (technology). Lastly, a creative session is organized with (future) patients and doctors to create an overview of the envisioned health path for 2030.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in problem definition . Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

I want to design a product or a product-service combination that improves the patient experience before, during and after the consultation of the future.

I am going to deliver deep insights in the patients and doctors concerns during a consult in combination with a solution for these concerns, with the main goal to improve the patient experience. This solution is a concept proposal for the future which is evaluated by patients and doctors.

* A product can also be the room or the environment.

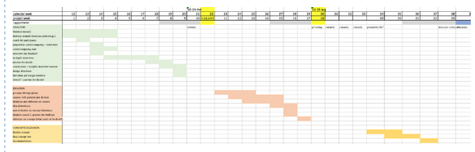
Personal Project Brief - IDE Master Graduation

TU Delft

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 15 - 3 - 2019 20 - 9 - 2019 end date



Down below a brief explanation of my planning is given:

I wi l start with the analysis phase (green). This fase exists out of the following parts: literature research, desktop research (business,technology), search for participants, preparation context-mapping + interviews, context-mapping start, in-depth interviews, process the results of the user study, conclusions + insights interview, formulate design directions and the fiist ideas per design direction. This information is summarized in the midterm presentation and report.

After the midterm the ideation phase starts (green). This phase exists out of an user evalution on the different idea directions, process the feedback, a session with patients and doctors, ideation sessions, concept directions, test concept directions, choice for concept direction, eleborate on concept (what needs to be done?). This information is summarized in the green light report.

The yellow part is the conceptualization phase, which consist out of finalizing the concept and conducting the last user test, after which recommendations for further development w ll be written.

Personal Project Brief - IDE Master Graduation

TU Delft

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you exp iotly want to address in this project, on top of the learning objectives of the Graduation Projet, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

During this project the following competences I want to learn and improve:

- I want to enjoy the process of this project, rather than focussing on the end result. I want to see this graduation project as a learning traject, instead as a "masterpiece".

- I want to experience a project whereby the concerns and emotions of a person are the starting point. Therefore I want to apply the Design for Emotion methods and techniques. This method suits this project very well and I hope to get inspired by this new way of working.

- I want to facilitate a creative session with non-IO participants, so I want to include a creative sessions with doctors and patients.

- I want to work very visually, since I enjoy drawing a lot. I hope to broaden my drawing skills within this project.

- I am very good at overthinking options, since I do not want to make the wrong decision. I want to learn to make decisions faster.

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Until my midterm I will work for 4days/week. I have a personal development course (which takes 1 day/week of my time). Next to this I have some back-problems and I fist need to strenghten my back before I can make full days. After my midterm I switch to 5days/week.

O: References Appendix

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