

Hans-Martin Birkelund Erlandsen

Designing Behavior

- Using Behavior Theory in Designing for Welfare Technology

Main supervisor
Kjetil Nordby

Secondary supervisor
Einar Sneve Martinussen

The Oslo School of Architecture and Design
Spring 2017

Foreword

There is an ongoing discussion in the design field on the literal possibility of designing behavior or experiences, or if these just can be indirectly influenced instead. In my opinion, there also needs to be more discussion on the ethical ramifications when designers try to “hook” and intervene in real people’s lives.

“Designing Behavior” is an interaction design diploma project, conducted by Hans-Martin B. Erlandsen, that explores how design methodology and behavior theory can contribute in the field of welfare technology. The diploma goal is that the delivery can contribute to or inspire relevant stakeholders in the medtech sector.

CONTENT

Intro **6**

Summary
Candidate
Scope
Methodology
Research Ethics

Research **14**

From Sickcare to Healthcare
A Health Revolution?
Welfare Technology in Norway
Treatment-plans
Expert Interviews
Field Study
User Interviews
Health Stakeholders
State of the art
Main findings
Reflection on Privacy

Direction **40**

User Profiles
Design Opportunities
Chosen Direction

Behavioral Design **50**

From Theory to Design tool
Research: Behavior Change
Psychologist Workshop
Developing a New Model
UBM as Design Tool

Concept Development **70**

UBM Mapping
Phase/Mechanism map
Wireframing
Testing

Delivery **86**

Design Proposal
User Journey
App Overview
Daily Use: Home screen
Daily Use: Treatment overview
Daily Use: Goals
Daily Use: Community
Daily Use: Cue
Onboarding: Setup
Onboarding: Opportunity
Onboarding: Capability
Use Contexts
Information Architecture
Mobile Navigation
Grid
Iconography
Visual Identity
Prototype
Feedback: Final Iteration

Reflections **130**

Contribution
The Attention Economy
Acknowledgements
References

SUMMARY

This project explores how behavior theory can be used to make welfare technology more engaging and better at facilitating healthy behavior change for patients with lifestyle diseases.

Everyday life is often the most important factor in treatment or rehabilitation for many patients. Currently, the health system has a limited capacity to assist in this context, as most patient to health-system interactions are limited to short visits or check-ups. This is in particular a challenge for people with non-communicable diseases, that are not immediately life-threatening, but develop over time.

Among health sector actors in Norway there is great optimism on behalf of welfare technology, which is believed to bring greater efficiency in the sector and improve the patient's experience.

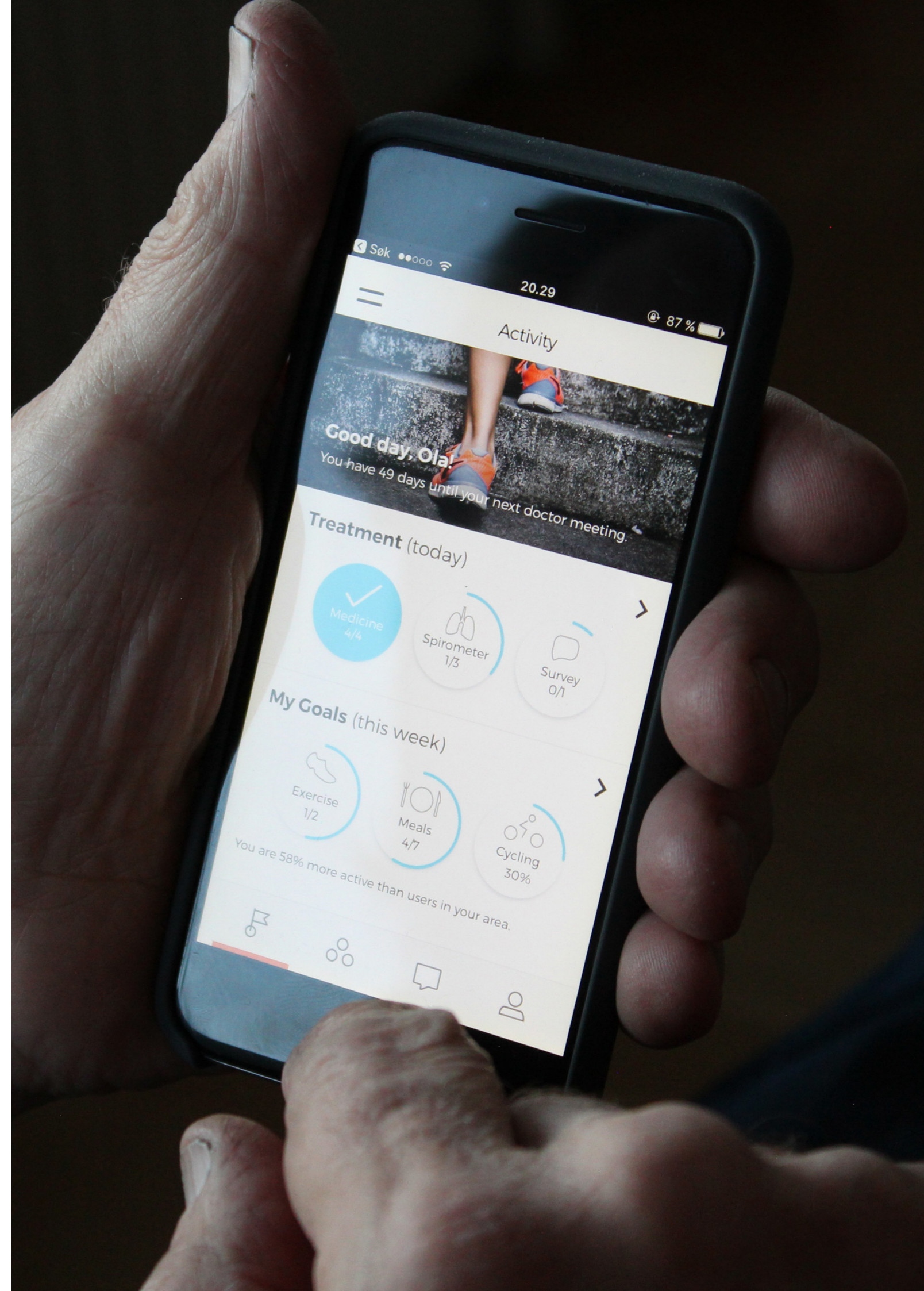
Welfare technology platforms today are largely based on self-reporting by users and remote monitoring. Many of them rely on an operator to maintain oversight and do not sufficiently empower the individual to master their own health with the help of technology. The fitness industry is often used for comparison, but they also struggle with behavior change with most health-trackers losing about 50 percent of the userbase within six months (Maddox, 2014).

My project brief, with the aim of meeting these challenges, was to combine behavior theory and design methodology. I wanted to explore how a digital service could make everyday rehabilitation easier, while making the user more in control.

To develop the concept, I started with an initial contextual research phase consisting of expert/user interviews, field observation and mapping. Here design opportunities and pain points in the home health-system were identified. Simultaneously, a study on behavioral theory was conducted, where I developed a new behavioral model, the *Unified Behavioral Model* (UBM). This model, together with the findings from the research phase, serve as the basis for the design proposal.

My concept is Motiv, a service that incorporates the UBM model to influence the patient's everyday health habits. This is partially done through: easy treatment-plan and progress overview, realistic goal setting, reinforcement of positive behavior, and a social community for helping and connecting with other patients.

Contribution-wise, the project offers inspiration on how a digital service for home/everyday treatment could be designed, which is relevant for stakeholders in the health industry. The UBM model, which I developed as part of this project, could be further refined, and applied in other digital services in healthcare.



CANDIDATE



Hans-Martin B. Erlandsen

Portfolio

www.erlandsendesign.com

CV

www.linkedin.com/in/hmerlandsen/

Mail

hansmartin.erlandsen@gmail.com

Phone

(+47) 97530936

Motivation

On a base level, I enjoy creative pursuits, especially when projects can contribute in a some way for people or organizations. As an aspiring interaction designer, I aim at improving synergy between people and technology/digital services.

With each new project, I am always trying to expand my skills as a designer and knowledge of a particular field. The diploma project is a unique opportunity to explore a topic of interest deeper than what is often possible later in professional practice.

I have had a long-standing interest in psychology and motivation. What drives people and why do they do what they do? Is it possible to influence those decisions through design?

By working with welfare technology and behavior psychology it is therefore possible to explore my interests in motivation and behavior, in a context where this could have a positive impact on someone's life quality.

Gaining insight into behavioral design and welfare technology, will also likely be useful in future design endeavors.

SCOPE

Problem thesis

How to **trigger motivation** and maintain positive **health behavior change**, for people with **cardiovascular disease** and **COPD** (chronic obstructive pulmonary disease), through a digital solution?

Main focus

Motivation & Engagement – Triggering motivation and achieving behavior change is central in the project.

User Experience – The overall experience should be pleasing, desirable and promote trust for the user.

Vision

To design a digital service that makes increases motivation and makes rehabilitation and treatment easier.

Interaction Design – Ease of use in the design delivery is important.

Feasibility - The project should be realistic, in order to showcase what is possible in the near future.

Relevance



Fig 1: Topics in this diploma such as welfare technology and lifestyle diseases are often brought up in the press. (Dagbladet, DN, NRK, 2017)

METHODOLOGY

Frameworks

I have used a personal approach that builds on several frameworks mainly the double-diamond model (British Design Council, 2005) and the lean startup-model (Ries, 2011).

The process could be described as: 1) user-centered, 2) holistic and detail-oriented and 3) iterative.

It should also be noted that the phases are to various degrees overlapping, not with strict divisions like the model (fig. 2).

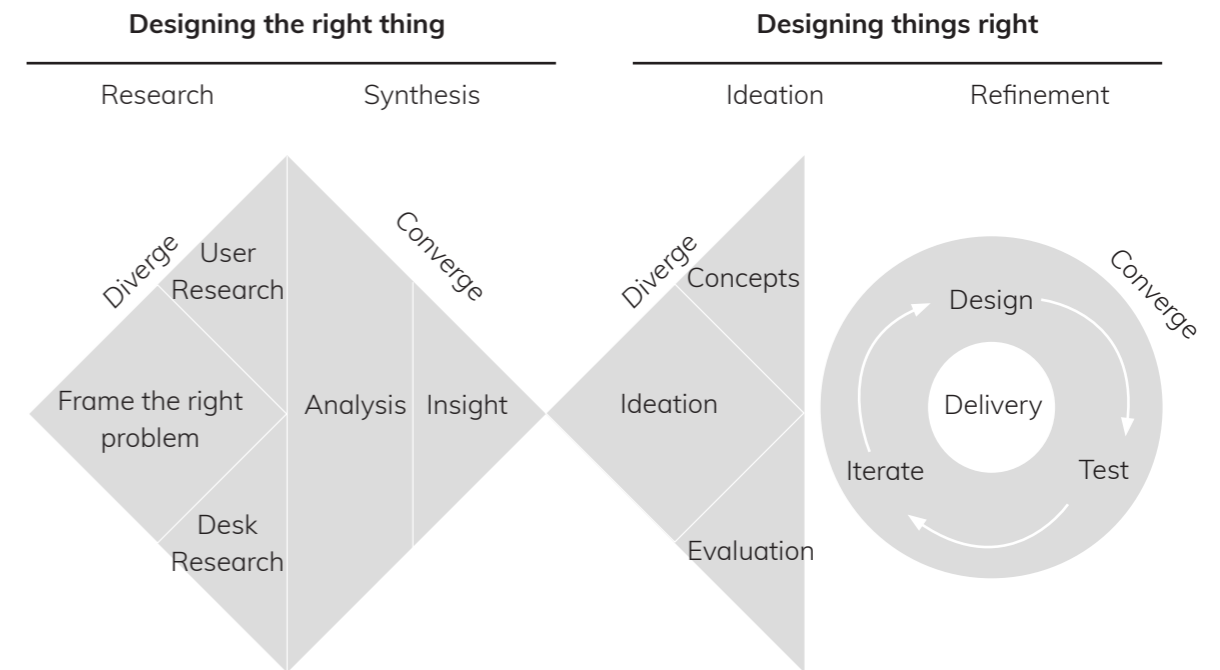
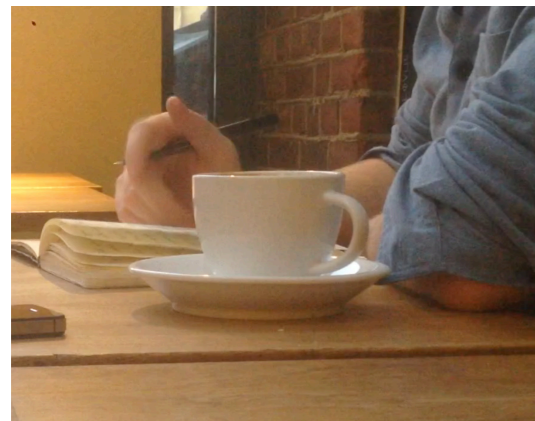


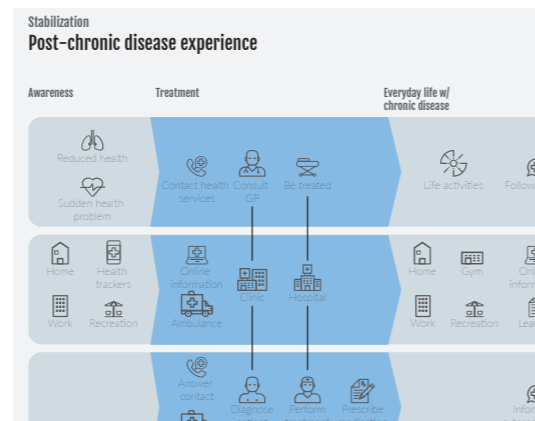
Fig. 2: Visualization of my modified approach.



1: Research

The first phase is all about data collection in order to understand the current situation and making sure the right problem is being solved.

Methods:
Design ethnography, field/participatory observation, focus group, interviews, desk study, trends and drivers



2: Synthesis

Using the data collected during research for mapping and analysis to make sense of the data

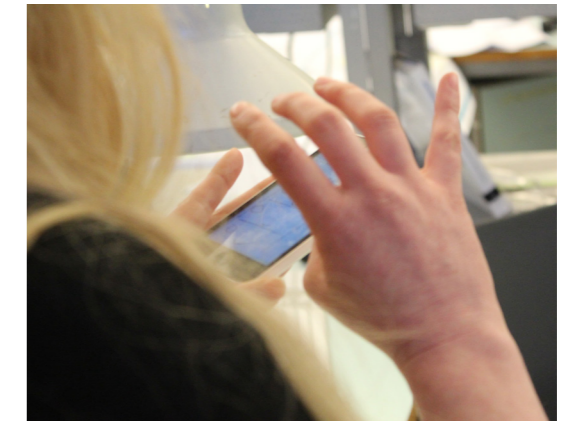
Methods:
GIGA-Mapping, ZIP-analysis (opportunity areas) user profiles (personas), context analysis, user journey



3: Ideation

With an understanding of the problem area, a foundation exists to develop potential solutions.

Methods: scenarios, storyboards, form factor analysis, requirements, concept mapping, experience-opportunity map, mind-mapping, forced association



4: Refinement

After one or a few concepts are chosen, one will then continue to develop and refine further.

Methods: Lo-fi prototyping, moodboards, usability testing, hi-fi prototyping, stakeholder feedback

RESEARCH ETHICS

Documentation and publication restrictions

This project has been approved by the Norwegian Centre for Research Data. Special restrictions is shown due the ethical concerns regarding patient security.

These were the guidelines the project had to adhere when in contact with patients:

- No directly identifiable data (name, personal number or photo with face) of patients could be collected during the interviews or field observation.
- Only indirectly indentifiable data could be collected: age, gender, profession, medical diagnosis, organization and voice.
- The data has to be kept at a secure server and locked physical location
- Written approval has to be given for any identifiable data in publication, otherwise the data has to be anonymized.
- All data has to be anonymized or destroyed by 09.06.17.

Any photos/videos with faces shown in the project are therefore reenacted and staged for communication purposes .



Fig. 3: Project approved by the Norwegian Centre for Research Data

1. RESEARCH

In this chapter I will present the most important findings from the initial contextual research phase.

Content

From Sickcare to Healthcare
A Health Revolution?
Welfare Technology in Norway
Treatment Plans
Expert Interviews
Field Study
User Interviews
Health Stakeholders
State of the art
Main findings
Reflection on Privacy

FROM SICKCARE TO HEALTHCARE

Rise of Non-Communicable Diseases

Traditionally, the health sector has focused on helping people whenever they become immediately ill or are injured from various causes.

Governments typically have also implemented preventive health measures, through public information campaigns and national health guidelines. However, prevention is likely going to become far more important in the years ahead.

In 2020, the World Health Organization estimates that 73% of all deaths globally, will be caused from noncommunicable diseases (WHO, 2009). There are four main factors driving these diseases:

- 1) Unhealthy diets
- 2) Lack of physical activity
- 3) Tobacco use
- 4) Harmful use of alcohol

The defining aspect of noncommunicable diseases (also known as 'lifestyle' diseases) is that they can be prevented by changes in a person's lifestyle.

One of the challenges with noncommunicable diseases is their slow-developing nature, which makes them difficult to detect and treat before they gain a foothold. Patients often put off visiting their doctor until they have symptoms, at which point prevention can be too late.

Another key challenge with these diseases, is the difficulty in changing someone's lifestyle. Even well-informed people often struggle with making the right decisions for their long-term health.

73%
of all worldwide deaths in 2020 –
caused by non-communicable diseases
(WHO)

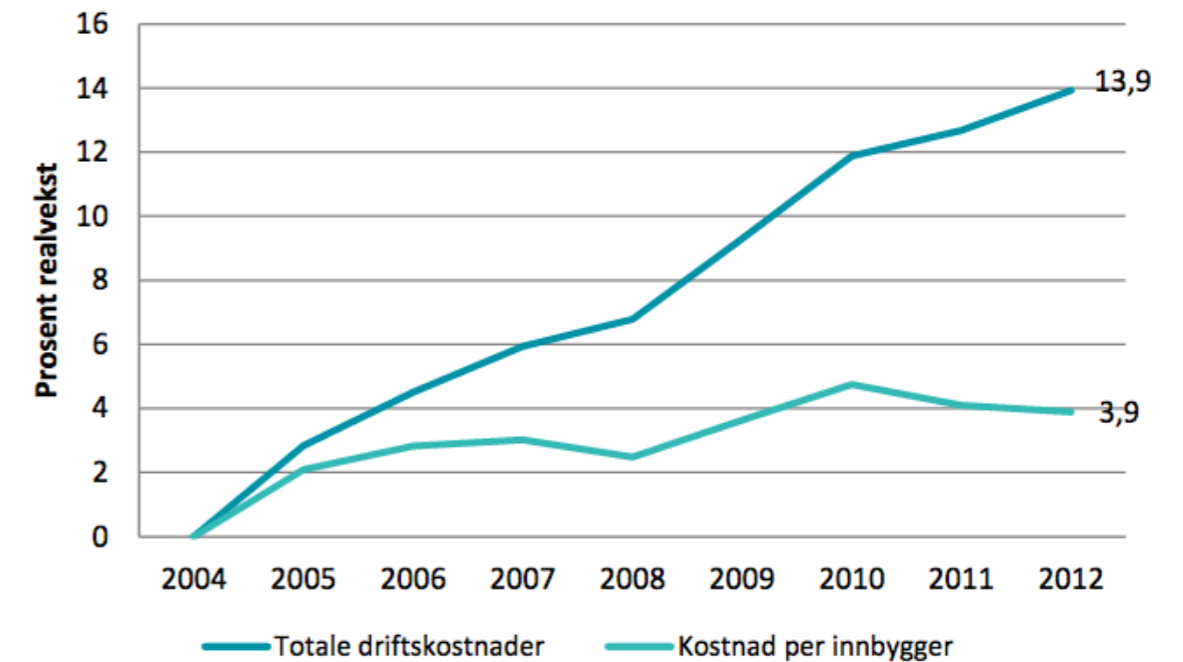


Fig. 4: Annual cost increase in percentage in the Norwegian health sector: almost 4 percent each year. (Helsedirektoratet)

Increasing health costs

Annually, the health expenses in Norway have on average increased 3,5 percent between 1995 and 2012 (Helsedirektoratet, 2013) (see figure 4). This growth is projected to continue to increase to around 6.5 to 6,9 percent in the year 2030, partly because of aging demographics.

Conclusion

When non-communicable diseases account for a majority of the public health spending (75 percent in the US today) (Mavrosti, 2012) and the prevalence of these diseases can be reduced by preventive actions, it raises the need for the health industry to shift focus from "sickcare" to prevention of lifestyle diseases.

1. World Health Organization (2009), 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable diseases. WHO Press.

2. Helsedirektoratet (2013) Medisinsk-teknisk utvikling og helsekostnader. En gjennomgang av aktuell kunnskap. Helsedirektoratet.

3. Mavrosti, F. (2012) From Sick Care to Health Care — Reengineering Prevention into the U.S. System, The New England Journal of Medicine. <<http://www.nejm.org/doi/full/10.1056/nejmp1206230#t=article>>

A HEALTH REVOLUTION?

Wearable computers

With the price and size of computing and sensors falling annually, it has become increasingly feasible to use mobile computers/sensors to quantitatively monitor health.

This can be seen with the boom in the fitness tracking industry, which is predicted triple in revenue to \$5 billion USD by 2019 (Lamkin, 2015). Many of these companies, including Apple and Fitbit, are continuously working on even more advanced sensors that will give users even greater insight into their own vitals/moods/activity/nutrition.

Behavior challenges

Although they have achieved tremendous market success, fitness trackers like Jawbone, Fitbit, Nike+, Fuelband, etc. struggle with long term engagement. Within six months after the purchase of a fitness tracker, about 50 percent of the users stop using it (TechRepublic, 2014).

Possible explanations include lack of flexibility for everyday integration, too much focus on data and low-level goals, wrong motivation mechanisms or poor usability.

“The [fitness] systems today address the data-enthusiast quantified-selfer much more than the moderately engaged Jane and John Doe who do not want to become data scientists of their own health data.”

Boll et al. (2016)

AI + Diagnosis

Technology behemoths, like IBM, Google, Microsoft, Amazon and Apple, are investing heavily in artificial intelligence. In the medical field, the leading AI seems to be Watson Health, which already, under its current development cycle, can diagnose certain diseases with greater accuracy than doctors.

Combining AI diagnosis with cloud services and wearable sensors, will likely in the future allow people to get diagnosed at home from their smartphones (Friedman, 2014).

National differences

In the Nordics a challenge is that much of this technology is being developed in the US, which has a different health system model than the welfare state. This means that perhaps not all of the new functions or private health models, are directly transferable, or at least some of them will have to be modified.

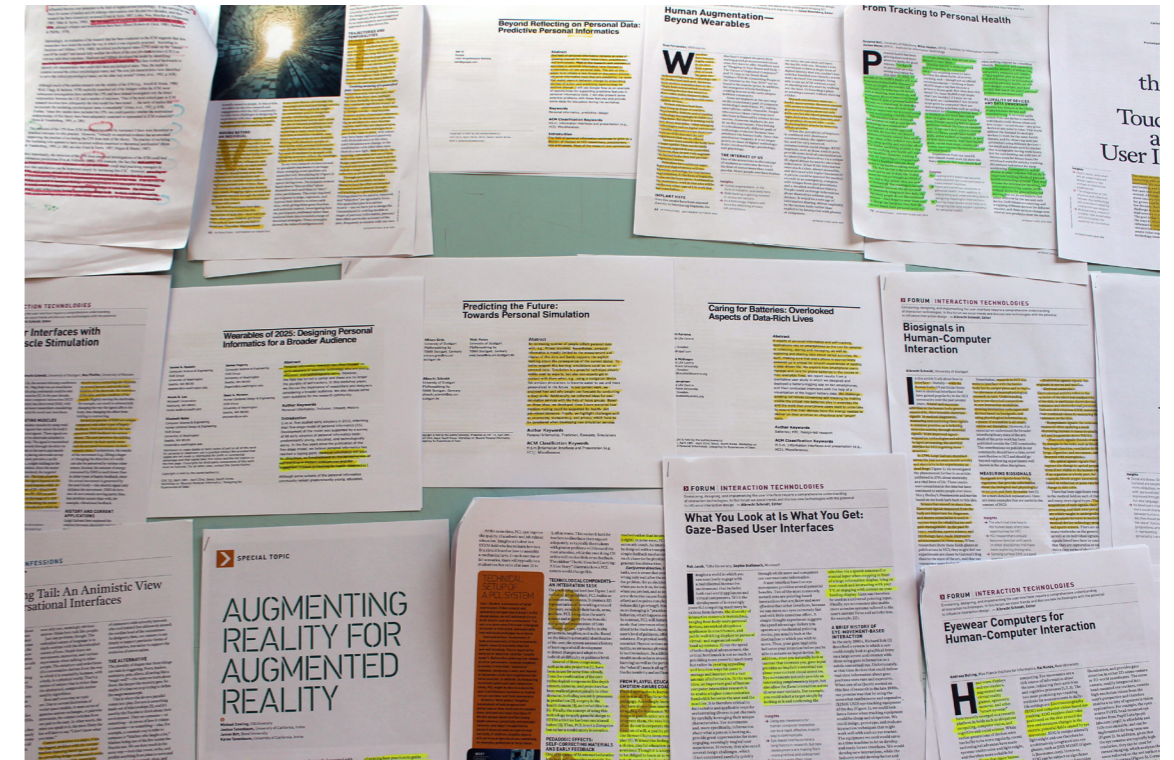


Fig. 5: Papers from desk study.

“If we are to take seriously a holistic, and lived focus on self-tracking, then we should recognize there is much to human experience that cannot be reductively or scientifically understood through data. (...) [lived informatics] should question: what aspects of lived experience can personal informatics really address and what are the implications of a data-driven life for how we experience the world?”

Elsden et al. (2016)

1. Lamkin, P. (2015) Fitness tracker market to top \$5bn by 2019, Warable. <<http://www.wearable.com/fitness-trackers/fitness-tracker-market-to-top-dollar-5-billion-by-2019-995>>
2. Friedman, L. (2014) IBM's Watson Supercomputer may soon be the best doctor in the world, Business Insider. <<http://www.businessinsider.com/ibms-watson-may-soon-be-the-best-doctor-in-the-world-2014-4?r=US&IR=T&IR=T>>
3. Maddox, T. (2014) Wearables have a dirty little secret: 50% of users lose interest, TechRepublic. <<http://www.techrepublic.com/article/wearables-have-a-dirty-little-secret-most-people-lose-interest/>>
4. Boll, S. et al. (2016) From Tracking to Personal Health, Interactions ACM
5. Elsdén, C. et al. (2016) Fitter, Happier, More Productive: What to Ask of a Data-Driven Life, Interactions ACM.

WELFARE TECHNOLOGY IN NORWAY

Health sector efficiency

One in ten of the Norwegian population today is over 70 years old. In 2060 this will have increased to one in five (SSB, 2015). This will lead to increased costs in the health care sector, which in addition to the current shortage of nurses (NRK, 2016), will require greater efficiency in the sector. Norway's PM Erna Solberg (Dagens Næringsliv, 2016) is saying that the Norwegian economy will in the future need to rely on welfare technology and fewer patients for each health-care worker.

Hospitals want a greater part of their patients to be at the outpatient clinics as opposed to staying over the night. This is because it is much more expensive for patients to stay at the hospital, and there is a higher risk of getting infected or diseases from other patients. A larger number of patients at the outpatient clinics, means they have to scale in both size and efficiency.

Successful pilot-project

The project VIS, *Velferdsteknologi i Sentrum* (Welfare-Technology in the Center) was a pilot project (2013 - 2015) that explored a welfare technology solution among elderly in Oslo. The project used Dignio AS' product as a platform and was conducted in collaboration with four city districts in Oslo, research institutions like AHO and the University of Oslo.

Overall, the project was concluded with both positive qualitative and quantitative results (Ørjasæter & Kistorp, 2015):

- 34% less visits from home nurses (hjemmetjenesten)
- 19% less hospitalized
- 33% fewer days at hospital
- Improved life quality of patients

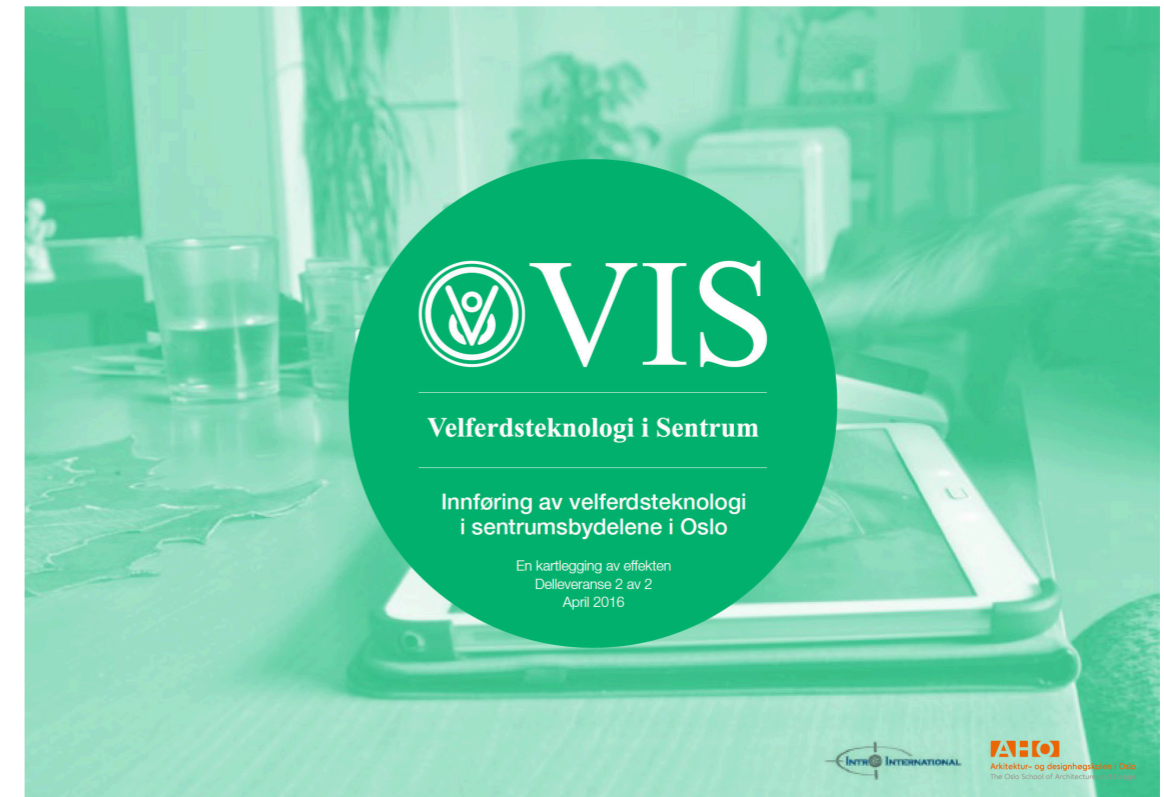


Fig. 6: Report from the pilot project 'Velferdsteknologi i Sentrum'

“After having worked so many years I have seen that the **patients have a large need for human contact**. Some have very few others (...) This box (Pilly SMS) does not provide closeness (...) but (welfare technology) can be very good for many.”

Nurse, Velferdsteknologi i Sentrum

“Sharing is getting back. Under your stay you will spend much time together with others in the same position as yourself. It has been shown to be a good source of both learning, support and comfort. **Sharing experiences with others, is something we know is very valuable and a useful supplement to what health-workers can offer.**”

Glittrelinikken (Lung) rehabilitation brochure

1. SSB (2015). *Befolkning nøkkeltall*, SSB. <<https://www.ssb.no/befolkning/nokkeltall>>

2. Kjærli, E. & Bostad, C. (2016) *Mangler over 2500 sykepleiere*, NRK. <<https://www.nrk.no/norge/stor-sykepleiermangel-i-norge-1.12872546>>

3. DN (2016). *Solberg advarer om at vi møter magrere tider*. <<http://www.dn.no/nyheter/politikk/Samfunn/2016/10/05/0522/solberg-advarer-om-at-vi-moter-magrere-tider>>

4. Kistorp, K. & Ørjasæter, N. (2016) *Velferdsteknologi i Sentrum*. Intro International & Arkitektur- og designhøgskolen i Oslo.

5. Helsedirektoratet (2017), *Andre gevinstrealiseringsrapport med anbefalinger*. Nasjonalt velferdsteknologiprogram. Helsedirektoratet.

TREATMENT PLANS

Health system

The Norwegian Health system is divided into the Primary Health system (Primærhelsetjenesten), which is the “first line” of health services including GP, home nursing, physiotherapists, etc, and the secondary health system (sekundær-/spesialisthelsetjenesten), which consist of hospitals, outpatient clinics and wards.

Outpatient clinics (or just clinics) are parts of the hospital designed for patients who require hospital treatment or diagnosis, but do not need overnight stays. This differs from other parts of the hospital where the patients will be assigned a hospital bed.

The outpatient clinics often have medical specialists, performing services within a specific medical field of expertise like heart or lungs disease.

A Progress plan

Nurses at hospitals use treatment plans (veiledende behandlingsplaner) in order to keep track of the patient’s diagnosis, treatment and status. Furthermore, simplified treatment plans are filled out in collaboration with the nurse/doctor and the patient, and is for the patient to use at home during their rehabilitation/treatment.

The treatment plan typically includes goals, a health progress plan, symptom self-analysis, medication, medical tests and exercise.

During a treatment program, the patients spends the majority of their time at home or work, living their daily life. In some cases, they have various medical devices at home (for instance a blood sugar test device), which they use as part of the treatment.

If the health condition of the patients has improved and become stable, they will be transferred out of the hospital care and back to their general practitioner.

Symptomer		Behandling
<p>Navn: _____ Selvbehandlingsplan for de som har KOLS</p> <p>Født: _____</p> <p>Tlf. arb. _____ Tlf. lungepol. _____</p> <p>Tlf. hjem / _____ Tlf. fastlege _____</p> <p>Sykepleier _____ Lungelege _____</p>		
Grønn sone	<ul style="list-style-type: none"> ★ Vanlig god form Trene x 1 pr uke 	<p>★ Slimmobilisering hver dag</p> <p>★ Aktivitet og øvelser hver dag</p> <p>Medisiner: Dose:</p> <p>Ant. dg:</p> <ul style="list-style-type: none"> ★ Seretide 50/500 diskus ★ Spiriva 16 mg 1 dose x1 ★ Ventoline Orz (dosa v/betras)
Gul Sone	<ul style="list-style-type: none"> ★ Forkjølelse ★ Økt mengde hoste og slim ★ Farge på slimet - grønt ★ Sykdomsfølelse evt. med feber ★ Tungpusten ved mindre anstrengelser enn tidligere ★ Evt reduksjon i PEF mellom 60%-80% av normal ★ Dvs. PEF under: Varm og kald 	<p>★ Inhalasjonskortison: dosen økes til: Antall dager: Spiriva 2 dose x1</p> <p>★ Anfallsmedisin: dose: Ventoline Orz 0,2 mg brukes fast 4 - 6 ganger daglig</p> <p>★ Slimmobilisering</p>
Rød Sone	<ul style="list-style-type: none"> ★ Du har ikke blitt bedre av gul behandling etter 5 dager ★ Du har økt sykdomsfølelse med feber og farge på slimet ★ Tung pust når du snakker ★ Evt reduksjon av PEF under 60% av normal ★ Dvs. PEF under: 	<p>★ Ta umiddelbart 30 mg. Prednisolon og besøk lege samme dag eller dagen etter</p> <p>★ Anfallsmedisin: dose: brukes fast 4 - 6 ganger daglig</p>
Dato: 27.09.16	Lege: _____	Sykepleier: _____

Røyker enda. Ønsker fornuks Maske. Ikke tatt AB på 3 år

Fig. 7: Anonymized photo of a treatment plan for a patient with COPD. Notice how the actions in the plan depend on the patient’s self-analysis of symptoms.

EXPERT INTERVIEWS



Fig. 8: Interview with VIS servicedesigner/researcher Kaja Misvær Kistrop.

“Some users found it very stressful to be called up many times when their measurements were outside normal ranges. This needs to be improved in a new solution.”

Kaja Misvær Kistrop, servicedesigner

“One of the positive feedback from the project VIS (Velferdsteknologi i Sentrum) was that **people did not feel alone anymore with their disease.**”

Kaja Misvær Kistrop, servicedesigner

Insight

Since the VIS pilot project was relevant to my thesis, I sought out and interviewed some of its stakeholders.

Based on the interviews I learned that the VIS project had been a success, but that there was improvement potential in automation, everyday life integration, mastery and variation.



Fig. 9: Interview with Dignio AS, VIS-technology/product platform.

“Some patients with chronic diseases have rarely experienced mastery/achievement in their life, with weak cognitive strength and **little experience with changing their lifestyles**”

Dignio AS

“From our experience, **nutrition, exercise and knowledge** of diagnosis are the most important factors in treatment and rehabilitation.”

Lars Dahle, CEO Dignio AS

FIELD STUDY

Observation

In order to gain insight into the existing Norwegian Health Service, I have kindly been allowed to visit and observe at Lovisenberg Hospital as well as Glittrelinikken Rehabilitation Hospital.

One surprising finding was that there is little data on whether or not the actual rehabilitation works long-term. The need for knowledge about one's disease and feeling of safety also became apparent.

“Most patients would rather stay at home than be hospitalized (...)
In the future more patients probably will have to be treated at home or outpatient clinics, since there are more patients and hospitalization is also very expensive. ”

Nurse

“Many patients are scared of pushing themselves during exercise. Patients with COPD often cough up a lot of slime during physical activity. However, it is actually good for them to get the slime up from the lungs. Knowledge about the disease is very important.”

Special-physiotherapist

“It takes time to understand the different aspects of your diagnosis, you can't learn everything at once.”

Nurse

“There is no data or research on how many of the patients continue to live well after rehabilitation. We don't know the actual long term effect [of rehabilitation]”

Special-physiotherapist

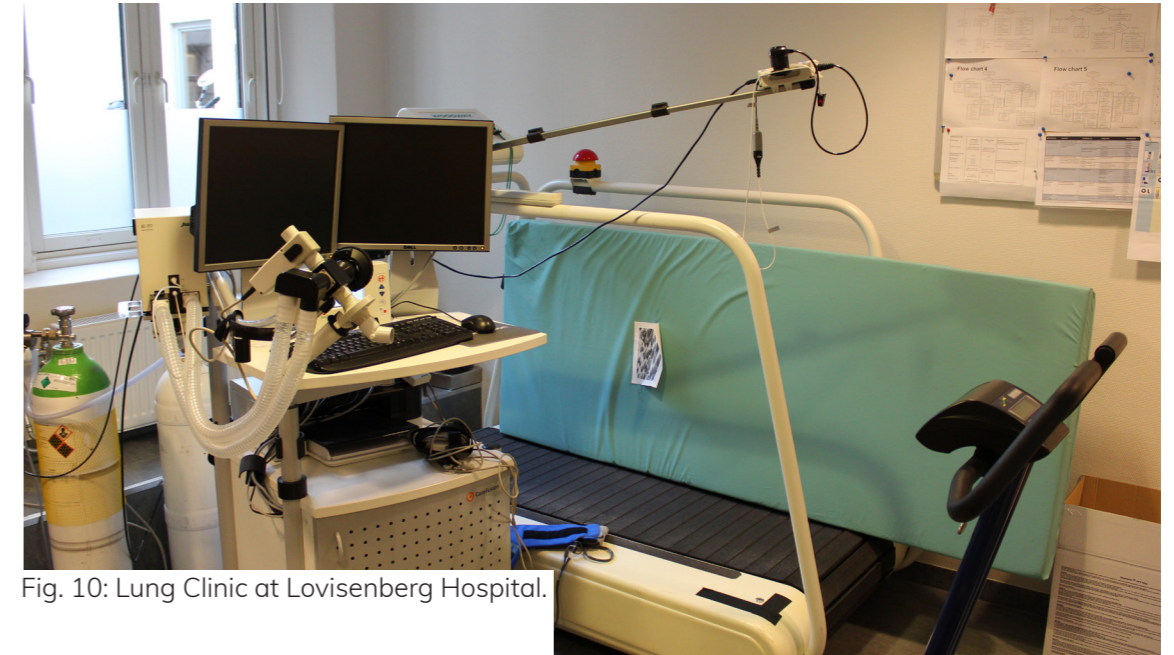


Fig. 10: Lung Clinic at Lovisenberg Hospital.



Fig. 11: Brochures, an important information channel about diagnoses, organizations and products in hospitals today.



Fig. 12: Glittrelinikken Lung Rehabilitation Hospital in Hakadal, built in 1925 originally for tuberculosis. (snl, 2013)

USER INTERVIEWS

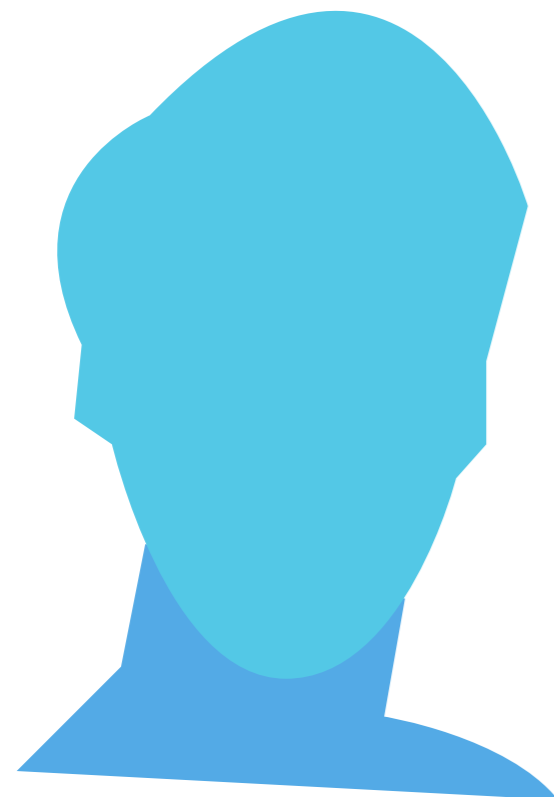
Finding User Needs

LHL is a patient-organization for people with heart and lung disease. I was allowed to participate in a full LHL exercise session and to interview members of the group afterwards.

I also interviewed users at Glittrelinikken and through my own network.

The main findings were:

- The importance of social community
- Negative mental feedback loops can be a challenge.
- Random information about patient organizations.
- Many desired more support with their disease in everyday life.



“They [the health system] said: “You have type 1 diabetes. Good luck!” This disease affects your psyche since you have to think about it all the time. **I hit a wall after a year and missed some psychological support.**”

Male, diabetes 1

“For the last years I have been ‘stuck’ in my chair. I have had much anxiety, depression and experienced many downs. **You want to improve, but you don’t believe in enough yourself to do it.** The pressure of expectations from others can be hard.”

Glittrelinikken-patient, COPD, asthma and diabetes



“Some nurses are good at informing of patient organizations like LHL, but I learned of it from a neighbour.”

Male, heart disease

Fig. 13: interview



Fig. 14: Focus group interview at Glittrelinikken.

“It is much more motivating to exercise together as a group than alone.”

Member of LHL exercise group with everybody nodding in agreement afterwards



“I’m active on social media and use computers, but I find it difficult to find news and information online from LHL”

Female, COPD

Fig. 15: LHL exercise group.

HEALTH STAKEHOLDERS

Beliefs and concerns

The Health Technology Conference 2017 (Helseteknologikonferansen) was arranged this year at Fornebu, Norway with many central actors holding presentations including:

The Norwegian Directorate of eHealth (Direktoratet for e-Helse), Teknologirådet, Sunnaas hospital, University of Oslo, NTNU, Oslo Medtech, Telenor, Sopra Steria, Inventas, etc.

“What scares me at the hospital is not the medical tests, but the floppy disk next to the PC.”

Eirik Newth, Astrophysicist & Futureologist

“Creating a coordinator, a common [welfare technology] plattform is very urgent.”

Erik Fosse, Professor of Medicine, UiO

Main findings:

- Welfare technology is a major focus in the sector.
- The sector is facing large challenges, such as rising costs, aging demographics, rising demands, but they believe that technology will solve the problems.
- Stakeholders agree that there is a need for a common welfare technology platform, but few agree on which one to use or develop.

“Implementing the technology is only 20% of the work, 80% of procedures, routines and organizational culture.”

Hilde Sørli, Department of innovation & E-health, Sunnass sykehus

“The biggest gains in health development in Norway now is through juridical innovation, instead of medical research.”

Erik Fosse, Professor of Medicine, UiO

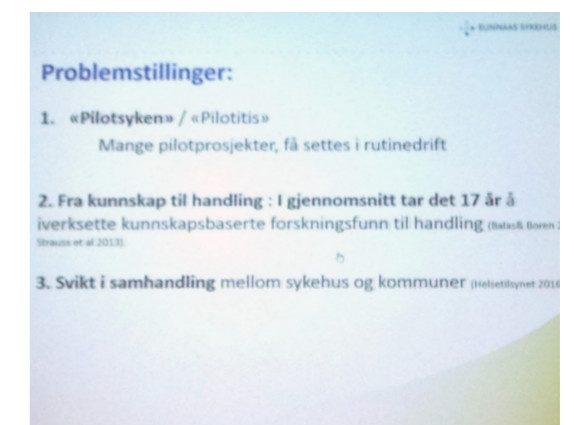
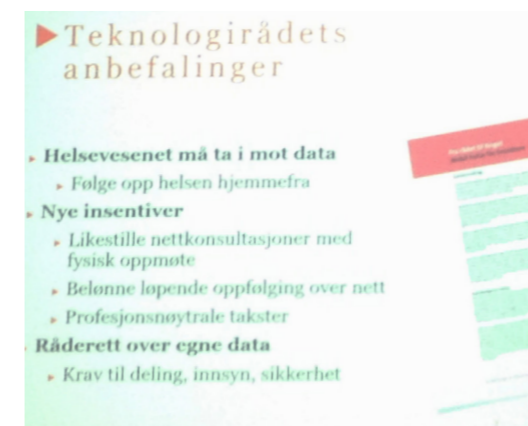


Fig. 16: Central keynotes from the conference.

STATE OF THE ART

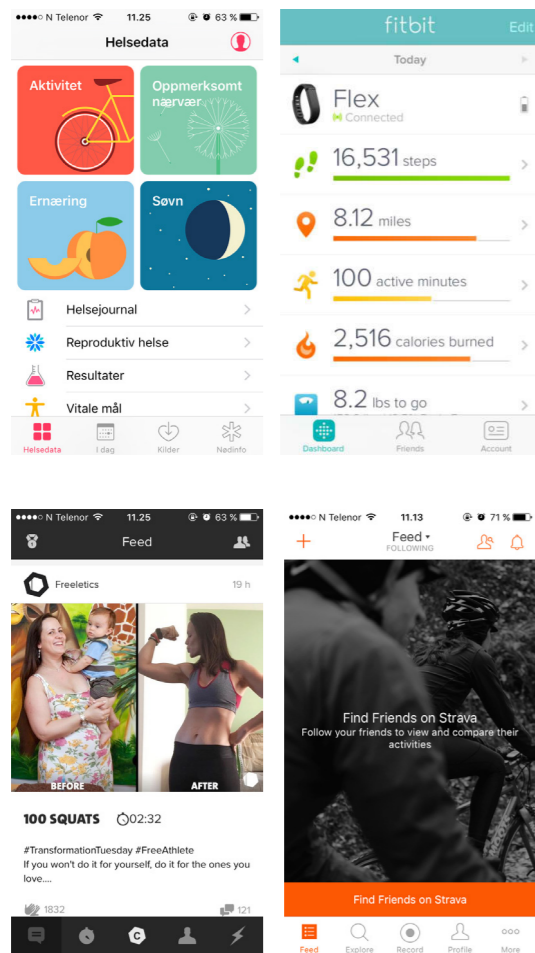


Fig. 17: Apple Health, Fitbit, Freeletics and Strava user interfaces.

Crowded Marketplace

During the project I analyzed many existing services in the fitness and health sector.

There are almost countless fitness and health applications existing today, but a few remain most popular.

As previously shown, many of these applications have a high user turnover-rate and struggle with long-term engagement. Those that perform better do so for various reasons, but important factors include personalization (Freeletics), Social Community (Strava) or device compatibility (Apple Health).

Welfare Technology Platforms

Similarly to fitness and health applications, there are many welfare technology solutions and platforms. One of the leading solutions in Norway is Dignio, which is used in the VIS-project (Velferdsteknologi i Sentrum).

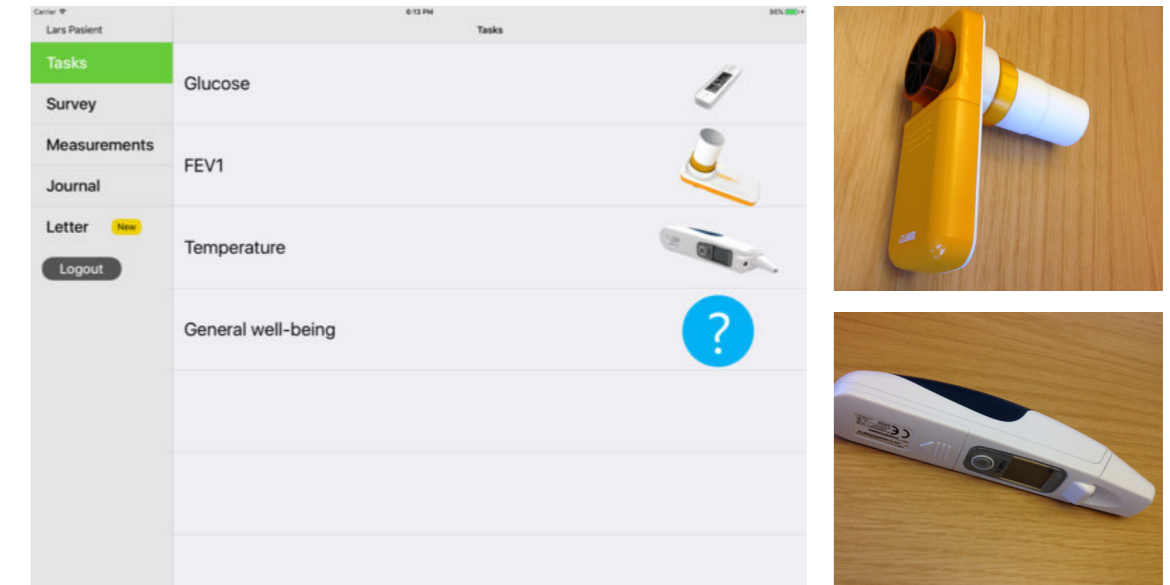


Fig. 18: MyDignio User interface and medical devices.

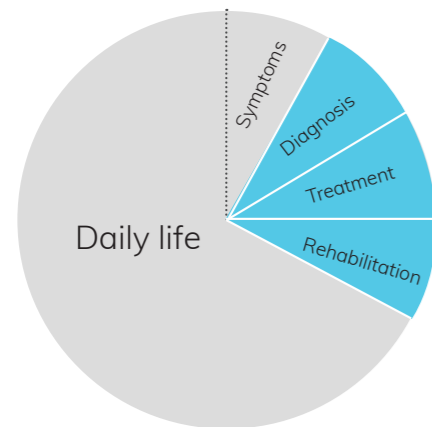
MyDignio

One of MyDignio strengths is that data from different medical devices is automatically transferred to the platform, reducing the need for manual data input. A system monitors the data and can notify health personnel if the values are outside healthy ranges.

Where the system can improve however, is that the user just feeds data to the monitoring system, and that there are no other motivation/behavioral mechanics used in the platform to increase user self-efficacy.

1. Apple Health (2014), Apple <<https://www.apple.com/lae/ios/health/>>
2. Fitbit (2007) Fitbit Inc. <<https://www.fitbit.com/home>>
3. Freeletics (2013) Freeletics GmbH <<https://www.freeletics.com/en/>>
4. Strava (2009) Strava Inc. <<https://www.strava.com/>>
5. MyDignio, Dignio AS (2016), <<https://itunes.apple.com/au/app/mydignio/id1166598602?mt=8>>

MAIN FINDINGS

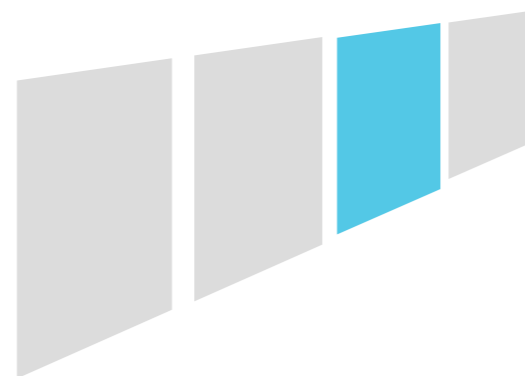


Many patients desire better support in everyday life when dealing with chronic diseases

The current Norwegian health system is focused on efficiently diagnosing and treating sudden symptoms/diseases, but the system struggles with supporting people's health habits in their everyday life.

“After rehabilitation [at Feiringklinikken] I was told to continue to exercise, but **no one followed up if I actually did so.**”

Male, heart disease



Uneven information distribution of patient organizations

Patient organizations can be of great help for individuals by offering support, knowledge, group programs, events, etc. Unfortunately, learning of this offering is based on brochures or if health personnel advise/know of them.

“Nobody [in the health system] told me anything, so **I had to learn on my own. I became inactive and my health deteriorated.** (...) Through a municipality-visit I was informed of LHL, and then I learned that there were exercise groups that I could join.”

Glittreklinikken patient

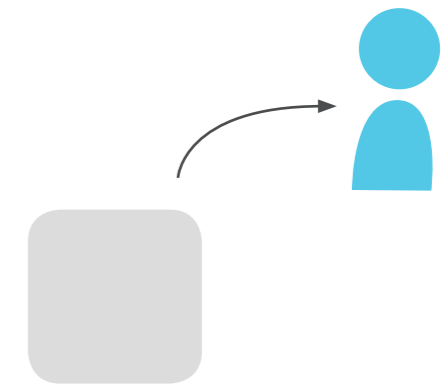


HealthTech's lack of integration in existing health system & too much siloing between platforms

The Healthtech & Welfare technology product-space is crowded with applications, but few of them are compatible with each other or different hardware. In addition, many of the solutions are developed abroad and not adapted to the Norwegian Health system.

“**Welfare-technology is coming fast, but it has to be integrated into the [Norwegian] health system.** (...) There are too many single devices, we miss common integration.”

Jon Helge Andresen, Program manager
The Norwegian Directorate of eHealth
(Direktoratet for e-Helse)

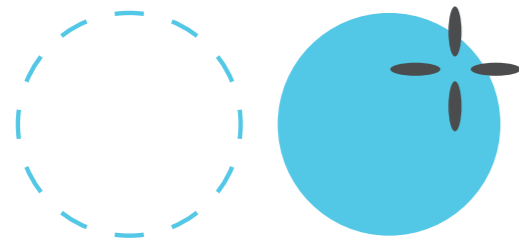


Health applications struggle with high user turnover

Many health applications have a high user turnover/attrition rate and struggle with long-term engagement. Many of them require a high degree of effort with manually inputting data, and are not flexible enough to fit into a person's daily routine.

“**Wearables have a dirty little secret that manufacturers don't advertise to consumers: 50% of users lose interest within a few months.**”

TechRepublic (2014)

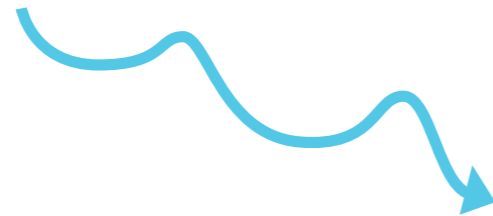


Health technology should either be invisible or fashionable, not stigmatizing

People generally want to be associated with their own identity and not a particular negative chronic disease. Many medical products are very different and broadcast to everyone that you are different/sick.

“I am me and I have diabetes, but it is not like it defines me as a person. (...) I want medical devices to be as little intrusive as possible.”

Male, diabetes type 1



Negative health development can be stressful and demotivating

Being repeatedly reminded of an negative progress and an experienced loss, is painful for many. It may also lead to a feeling of hopelessness and lack of self-belief.

“I became stressed and unmotivated by not reaching health goals. Now my goals are just to show up at the exercise.”

Glittrekliniken-patient, COPD

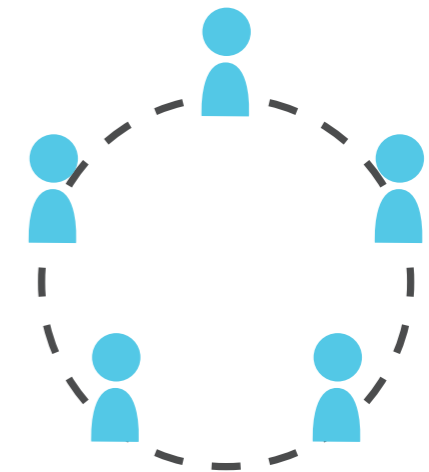


There are individual differences in motivation and may differ over time

People have different life experiences, personalities, association with behavior change and capabilities. Treatment therefore has to be individualized to be effective.

“The most defining aspect in rehabilitation is what type of personality you have. Some are self-driven, some like to be pushed, some don’t.”

Dignio AS



Social incentives, positive progress and identity are powerful motivators

How strong this effect is, appears to vary in-between people, however many seem to care a great deal of social approval, fellowship and camaraderie. Many behavior change communities like AA (Anonymous Alcoholics) leverage this effect to achieve long-term habit change.

“Accepting that you have to live with a chronic disease does something with you mentally (...) **Feeling progress and improvement is important for motivation. Just exercising three times a week gives me mastery and joy and it is important to meet likeminded people, and it is social.**”

Glittrekliniken patient

REFLECTION ON PRIVACY

Key Concerns

One of the concerns to consider when working with real patients, health data, remote monitoring and arguably 'manipulative' methods for behavior change, is ethics and privacy.

Any data that is digitized can be hacked and accessed by individuals with unknown intentions, even if proper security measures are implemented, like encryption and secure server storage. The potential fallout of personal data in the wrong hands, can be severe, and can potentially lead to social humiliation or even injury/death. Manipulating someone can be considered a breach on their free will.

Ethical premise

Considering the potential negative consequences: are there any cases where the greater good for the individual and society, of using a solution based on this technology, outweigh the potential negative impacts?

Precedence

If we consider the current practice in the health sector, then digital systems are used throughout, with great lengths taken to ensure the security of the health data.

Therefore, one can induce that it is currently considered 'morally' right to digitize health data, because it increases productivity, accuracy, and searchability, which has a positive impact on people with a negative health condition.

Voluntarily approach

Based on this same argument, one can say that, it can also be ethical to remotely help patients in their home, since it likewise can positively affect their health condition.

However, what about people/patients who are not currently ill, but just would like to maintain or improve their health? Juridically, as long as the decision is voluntarily, one has the right to make decisions about one's own health.

"It depends on your health condition. Back when I was ill, I would have no hesitations with someone monitoring my health data, if that meant I could become better. However, now that I am fine, I don't see the need for that."

Male, 30

Questionable area

A more difficult, murky area, arises when considering of using remote health monitoring, for other gains than health, like insurance, or surveillance. By not working or aiming my project at these actors, I will avoid this area.

Conclusion

As my design proposal will be within the area of health improvement, I believe it is well within the current moral and juridical precedence, as long as the service is voluntarily.

"Should technologists and UX professionals shy away from helping this area grow? For some, this is an exiting technology that will shape the future. For others, it is a scary social nightmare that must be stopped. Like many things in life, it isn't, and can't be, black and white.

[...]

For technologists and designers, this fact will pose new challenges that will force us all to balance business opportunity, design challenges, and ethics on a new scale. Hopefully we are up to the task. My belief is that we are."

(Fernandes, 2016)

1. Fernandes, T. (2016) Human Augmentation – Beyond Wearables, Interactions ACM.

2. DIRECTION

Through the contextual research and mapping, several pain points and design opportunities were discovered.

Content

User Profiles

Design Opportunities

Chosen Direction

USER PROFILES

Behavior patterns

Based on the interviews with users and experts, I mapped out behavior-patterns and found some common denominators.



Time-squeezed

Many of the users I spoke to had for several years, deprioritized their own health.

Users mentioned different reasons for not taking care of their health, but a common factor was working too much or prioritizing others (family) over oneself.

This user group might not yet have developed any negative health symptoms, but they are at greater risk.

One of the challenges with this user group is how to integrate healthy habits into their existing busy routine.



'Stuck in a rut'

Certain users described how they had been 'caught' in a negative mental state either after becoming a pensionist or after receiving their first medical diagnosis.

Poor health habits such as smoking, excessive drinking, lack of activity, unhealthy nutrition may be correlated with this mental state.

This user group seem to represent a very difficult group to achieve behavior change.



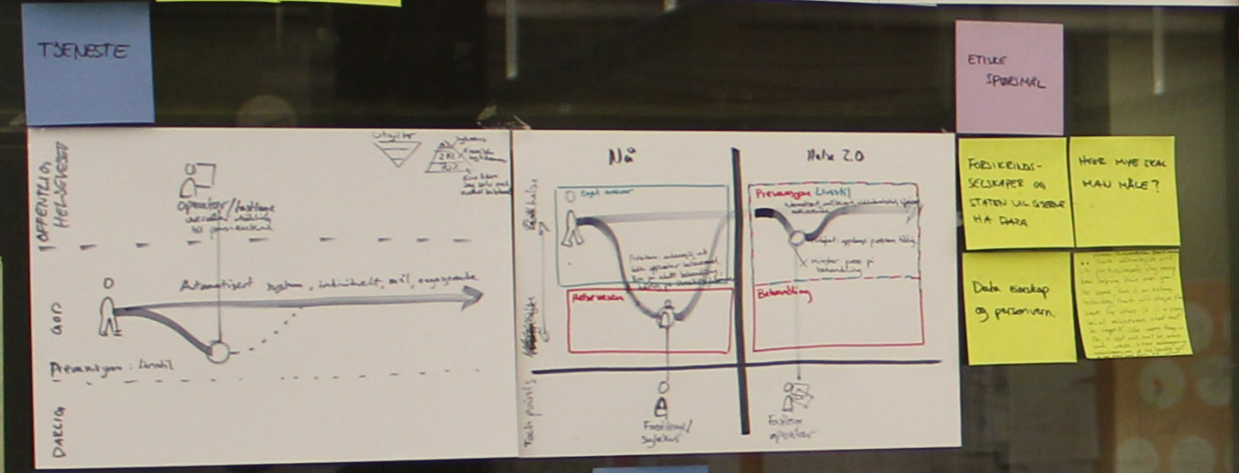
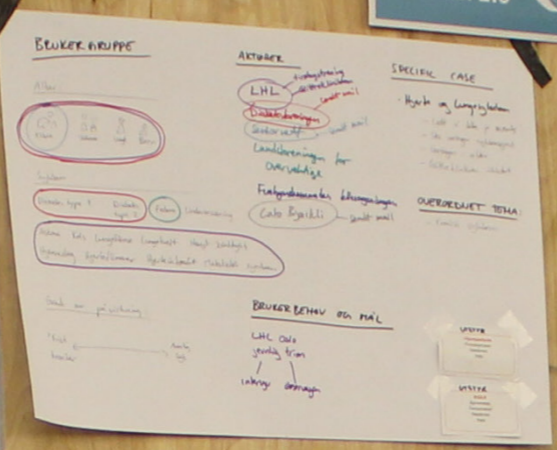
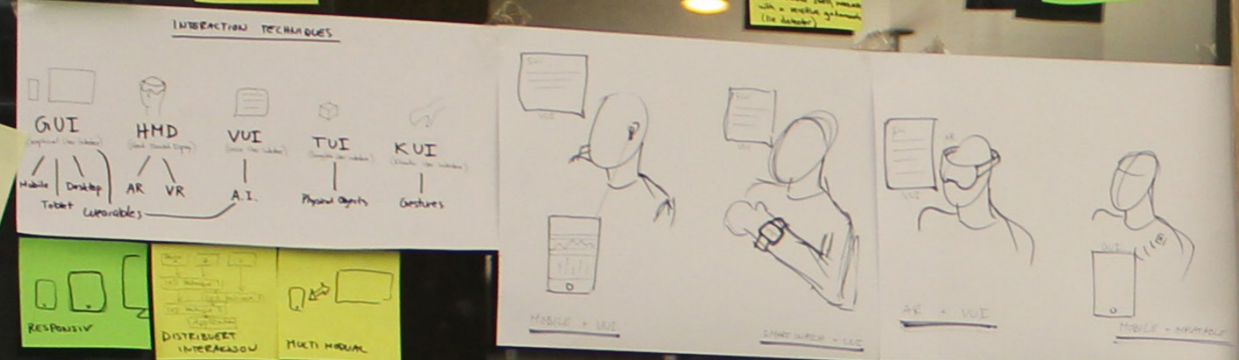
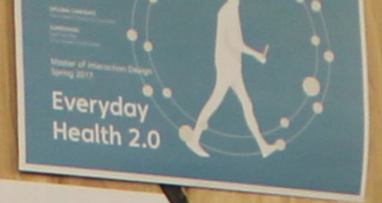
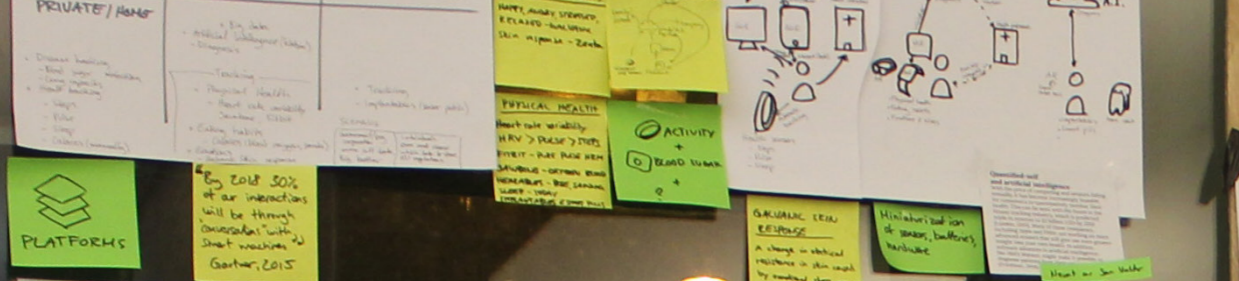
Age related

According to Hilde Sørli at Sunnaas sykehus, elderly on average have 7 to 8 different diagnoses at a high age.



Environment affected

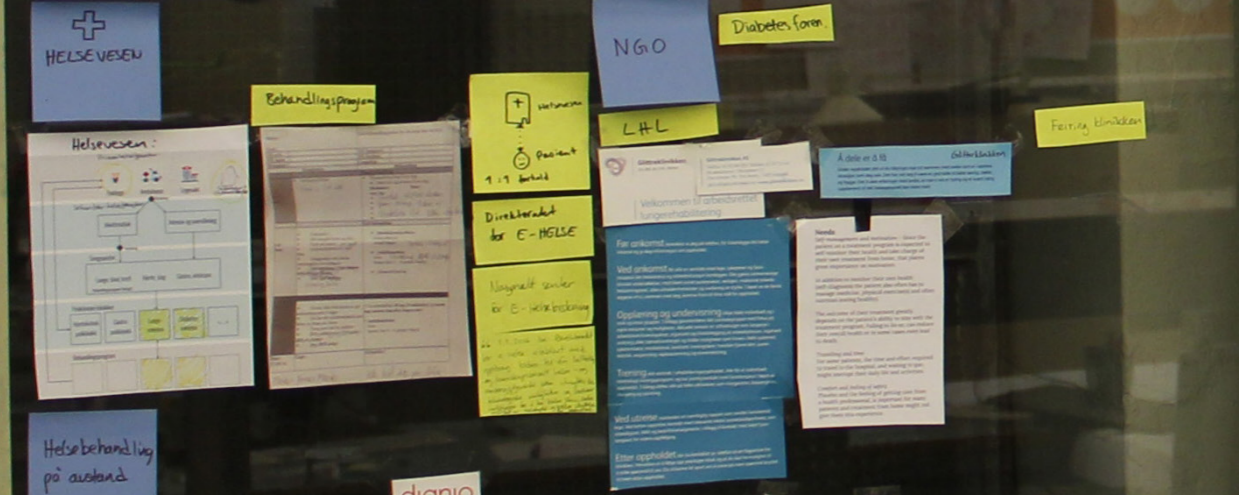
Some of the patients I spoke to had been exposed to factors that lead to their diagnosis. For instance, one was a farmer that had been exposed to dust/pesticides that lead to COPD. Other factors like city pollution could also be contributing.



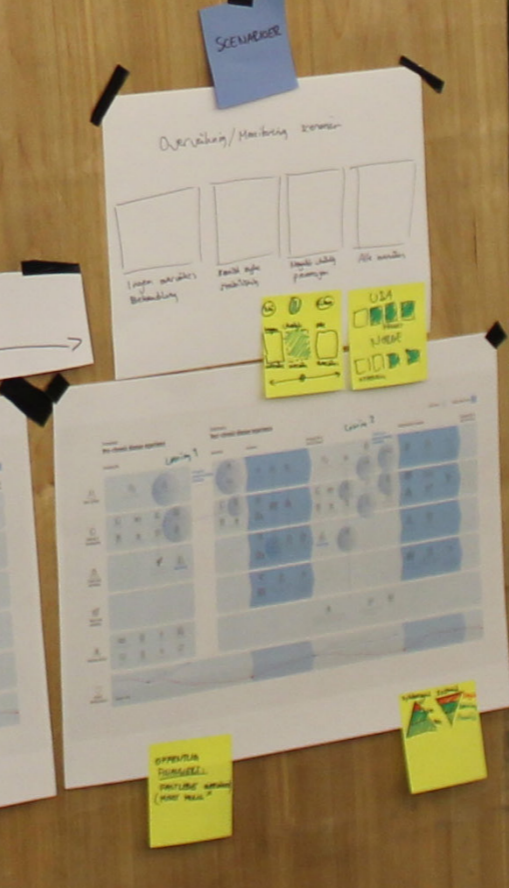
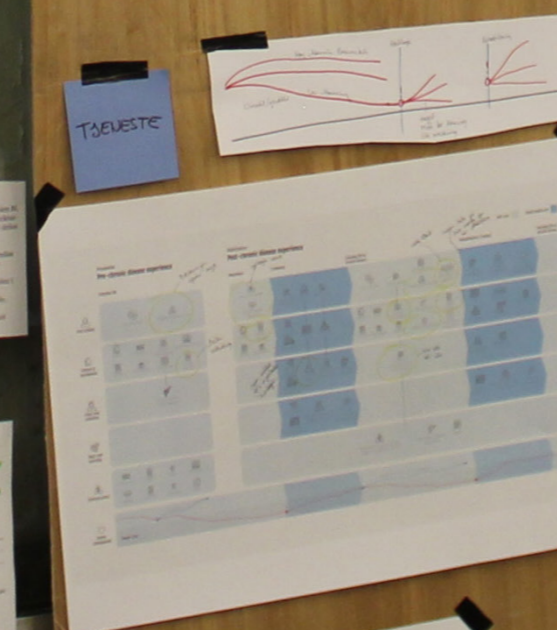
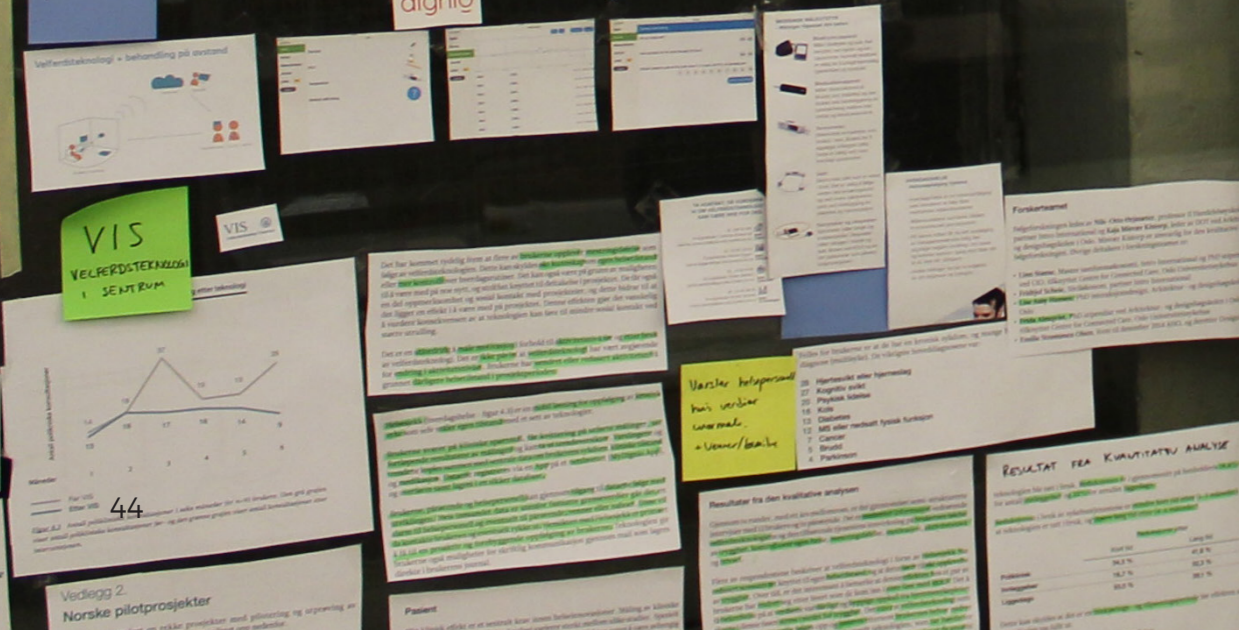
USER PROFILES

- Personer som er i behov for hjelp
- Personer som har behov for hjelp
- Personer som har behov for hjelp
- Personer som har behov for hjelp

Grid of sticky notes with various handwritten notes and small diagrams.



Handwritten notes and diagrams related to user profiles and service.



DESIGN OPPORTUNITIES



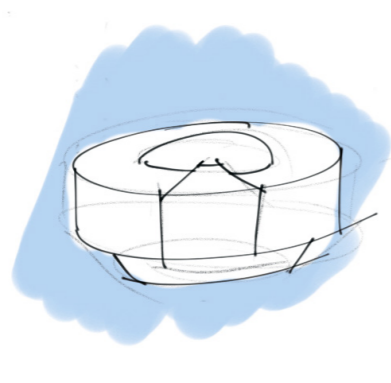
Health Behavior Digital Platform

Project type:
Interaction Design
Behavior Design

My original idea of a concept direction that was strengthened through the initial research phase.

The solution should consist of a digital service that helped people during treatment/rehabilitation in their daily, everyday life, which is often the most important factor in recovery.

The concept would use behavior mechanisms from psychology to try to motivate people onto a better lifestyle-path.

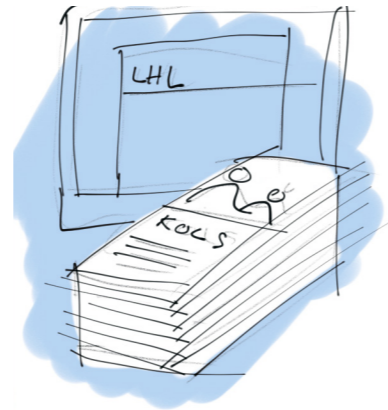


Medical devices Aesthetics + Usability

Project type:
Industrial Design
Interaction Design

As health devices their main function is utilitarian - to provide a useful function for the patient. However, several of the users have also stated that they are uncomfortable with the stigmatizing aesthetic of these devices.

A project focusing on inclusive design, ergonomics, usability and aesthetics could likely add value for this user group.



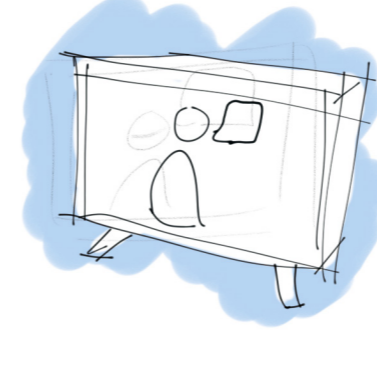
Patient-organization Communication

Project type:
Interaction Design
Communication Design

Several patients mentioned that they discovered patient organizations like LHL and Diabetesforbundet by accident. In addition, some also said that they found it difficult, and somewhat lacking, to find relevant information online.

After the field studies, I was contacted by LHL who were in the process of starting a similar project.

I have used some of the insights from this direction in my final design proposal.



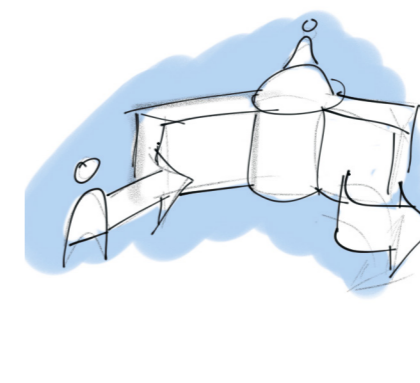
Public Enlightenment Channels

Project type:
Communication design
Marketing
Interaction Design

Gaining knowledge about one's health, threats and risks are important in defining behavior. This is an area that traditionally governments have placed emphasis on.

A project like this would be focused on health prevention through marketing or public communication.

One of the drawbacks of this concept direction, is that knowledge does not always lead to intention or action, and not everybody are swayed by rational facts.



Patient Experience in Rehabilitation

Project type:
Service design

One of the great challenges with the current Norwegian Health system is that patients are sent between all kinds of different institutions, locations and organizations.

These different institutions do not always cooperate well on with each other on different levels, including software compatibility, inter-communication, routines, etc.

For the patient this can sometimes feel like they are a "hockey-puck" that is being passed around, compromising the overall patient experience.

A service design based project could possibly discover feasible ways the existing system could improve both for the user and the health personnel.



Professional Tools for Health Workers

Project type:
High Performance Interfaces,
Interaction design

Several of the health professionals I interviewed complained about the lack of usability in their work tools.

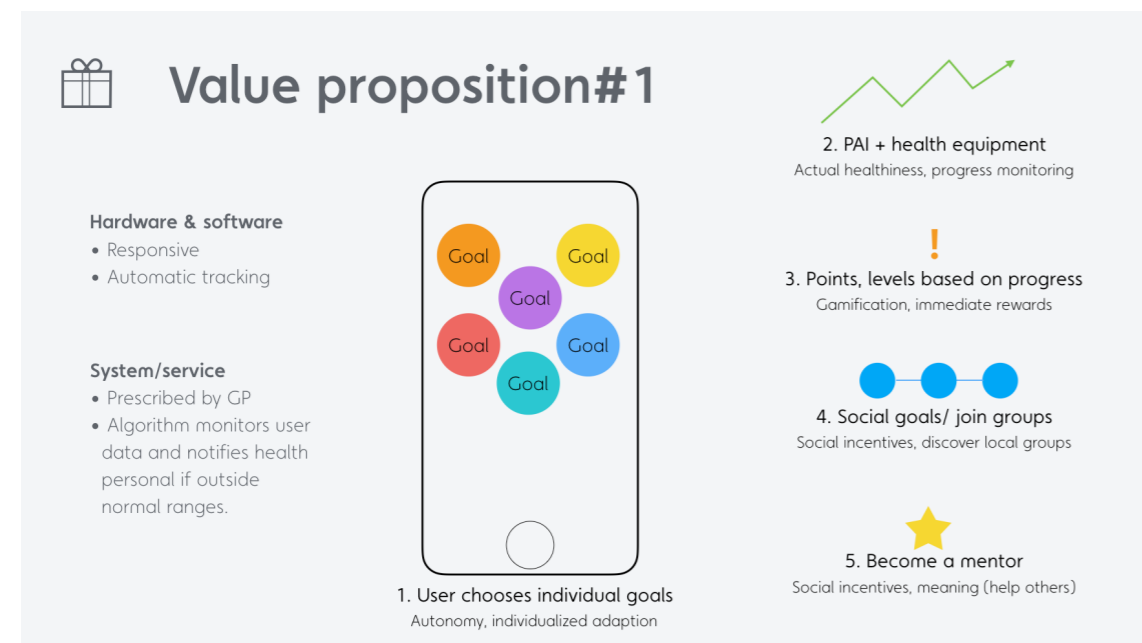
Through the research it also became apparent that the software was based on a outdated desktop interaction paradigm, and was neither optimized for the health professionals work routines, nor did take advantage of current technological opportunities.

CHOSEN DIRECTION

Midterm 1

This was the the chosen direction presented during the first midterm presentation during the semester.

I decided to continue with this design direction, because I saw that as a significant untapped opportunity, where the current health system is lacking.



Overview

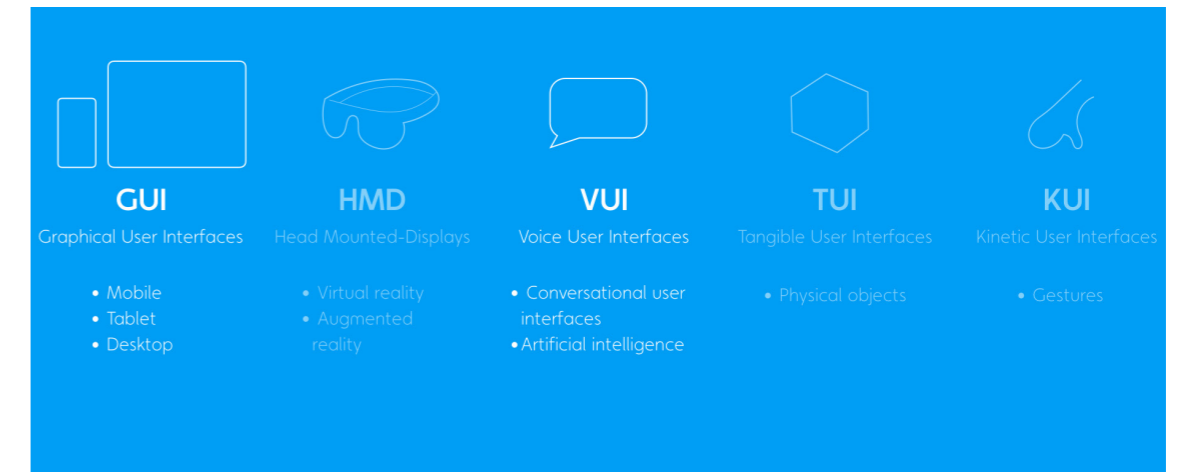
This direction would consist of a digital service for COPD and cardiovascular patients on rehabilitation, aimed at helping them in their daily/everyday life when not at the hospital/clinic.

Behavior Change

The main feature, as well as design challenge, with this design proposal, was that it would facilitate healthy behavior change.

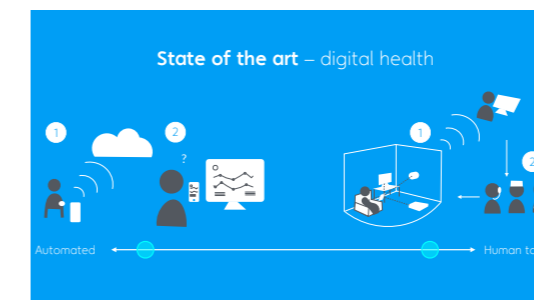
In the beginning, I had some ideas of how this could be achieved, for instance gamification or goal-setting, but a deeper study and experimentation of the behavior mechanisms had to be initiated.

Platform choice



After considering different options, GUI (Graphical User Interface) was selected as the final platform, as a contemporary technological paradigm is more than sufficient for the behavioral innovation in this concept.

Balancing Automation and Human Touch



On a system level, data from the user would be monitored externally, and health personnel notified if the health values were out of range.

However, the concept would also focus on automating many functions related to behavior change to make the user more self-sufficient.

Integration in existing Health System



The concept would also be integrated into the existing health system, but I would focus more on the interaction design and motivation, than the service implementation.

3. BEHAVIORAL DESIGN

In order to develop the concept, I did a study on behavior theory. In this chapter I will present some of my main findings, and why I developed a new behavioral model.

Content

From Theory to Design tool
Research: Behavior Change
Psychologist Workshop
Developing a New Model
UBM as Design Tool

FROM THEORY TO DESIGN TOOL

Best practices – not always enough

A typical method in design practice, is to look at best practices in the field. This can give inspiration of what other designers/ developers have done, and reveal some practical solutions.

Early in my behavior research phase of the project, I did this and started analyzing what other digital solutions had done and were doing.

The main drawback with this approach is that it can often only provide a superficial understanding of the underlying decisions. In order to gain understanding on a deeper level, I started studying behavior psychology theory.

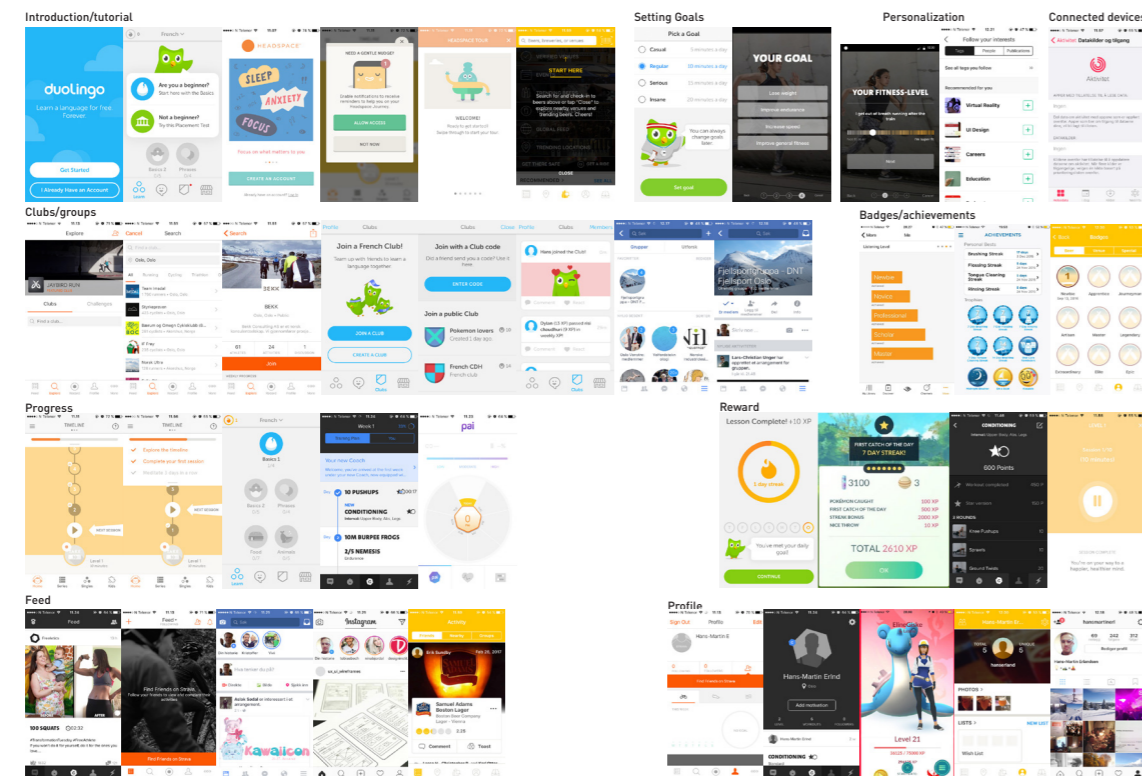


Figure 19: Best practices overview looking at how different platforms solve engagement goals.

Approach

In order to gain knowledge of behavioral design, my process has consisted of the following:

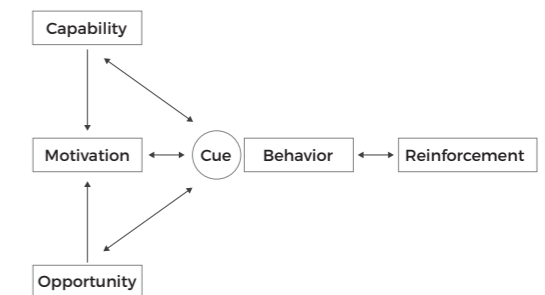
- A literature study including books on behavior & engagement, as well as academic research papers.
- Best practices case studies in design.
- Understanding of psychological models and principles.

- Experimentation with models, looking at where they overlap and fit into each other.
- Using models and principles in user journey mapping.
- Expert feedback and discussions.
- Development of a revised behavior model.
- Designing a canvas based on this model to be used in other projects.

Developing a new model

One of the goals with the research on behavior design was to discover a general model that I could use as the basis for the digital service.

After becoming aware of limitations with the other models, I started developing a revised model that ideally would contain the advantages from different frameworks, and contain less of their weaknesses. I won't go as far to say that this model is final, and it definitely should be tested more, but for this project the UBM model worked very well.



First iteration of the model, that was later revised after feedback from Jan Egil Nordvik.

RELEVANT BEHAVIOR CHANGE MODELS

Dugg's Habit Model

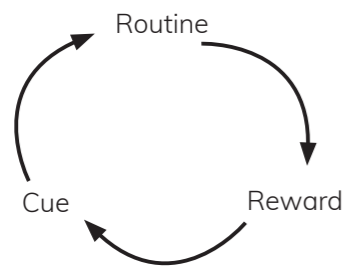


Figure 20: Dugg's Habit Model (2012)

Dugg's Habit Model describes how habits work. They start with a cue (aka. trigger), which can both be internal (intrinsic feelings/needs) and external (from environment) behavior activators. Over time the routine (aka. action/behavior) will become more automated (to free up cognitive load) and the user will associate a reward with a cue (Pavlov's dogs example). To change a habit one should keep the cue and the reward, but switch the routine/ action.

The Hooked Model

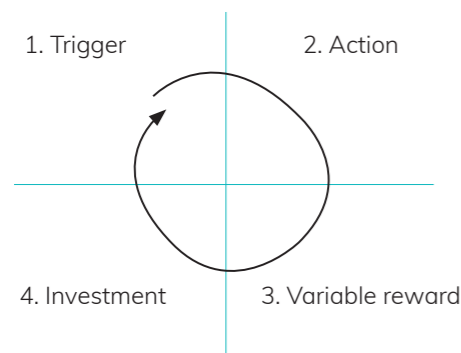


Figure 21: Eyal's Hooked Model (2013)

The Hooked Model (Eyal, 2013) builds on the habit model and is a model referenced by many designers describing how it is possible to "hook" users in four phases:

- 1) Triggers that activate behavior.
- 2) The action/habit itself.
- 3) Variable rewards, which the user cannot predict. There are three types of variable rewards: Rewards of the Tribe (Social Rewards), Rewards of the Hunt (Rewards of Discovering the Unknown) and Rewards of the Self (Mastery and Self-Development)
- 4) Investment that increases the value of the product over time.

The negative aspects of this model is that it does not consider external factors outside the user's control, nor the user's capabilities.

Fogg's Behavior Model

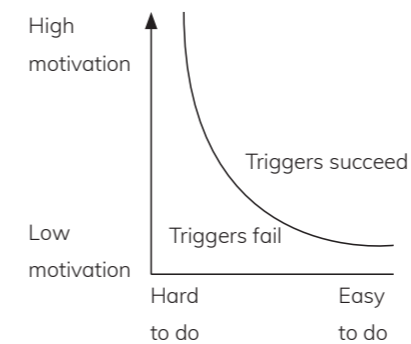


Figure 23: B.J. Fogg's Behavioral model

B.J. Fogg describes a behavior equation (Behavior = Motivation + Ability + Trigger), which says that behavior will not occur without motivation, ability and a trigger. His behavioral model shows that for users with low motivation, triggers that require high effort will not work, whereas users with high motivation can complete hard tasks. Therefore, one should tailor the challenge to the motivation/ability of the user, or start with "small wins" to build self-sufficiency (confidence/motivation).

Self-Determination Theory

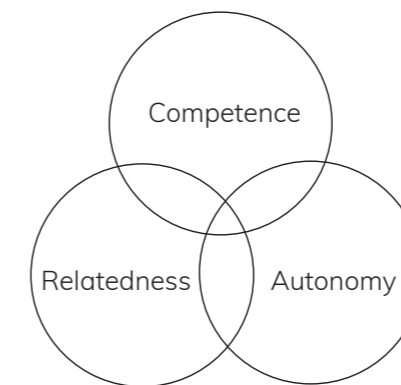


Figure 24: Self-determination theory

SDT builds on decades of psychology research and looks at people's basic need for growth, which drives intrinsic (self-driven) motivation. According to SDT people have three main intrinsic drivers:

- 1.) Competence: the ability to effectively interact and control with the environment.
- 2.) Relatedness: Feeling of being close to a community/a collective greater purpose.
- 3.) Autonomy: feeling of self-initiation and self-regulation of one's behavior.

Goal Setting Strategy

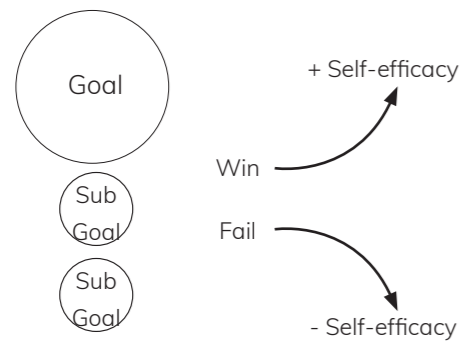


Figure 25: Goal setting theory

Research on goal getting shows that if the person has the intention, the goal setting process will divide the goal into smaller, more achievable sub-goals. Succeeding with goals increases self-efficacy (perceived behavioral control aka. confidence), which means that the person will have the confidence to try harder goals. However, failing at goals decreases self-efficacy, leading to less self-belief. Therefore, goal setting should be as realistic as possible, to reduce the odds of failing.

Optimism bias

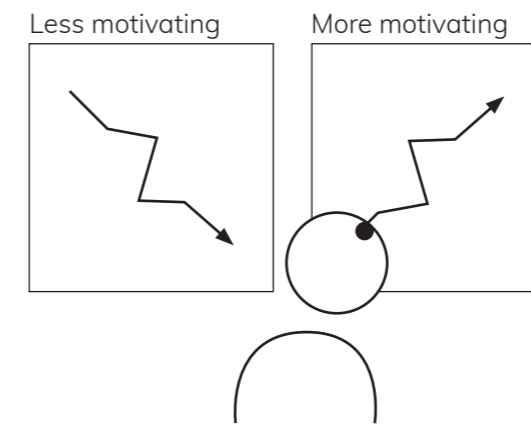


Figure 27: Optimism bias.

The optimism bias (Sharot, 2011) is a cognitive bias describing how people when it comes to behavior change, have a better ability at coding positive information about progress, than negative information about decline. In order to get people's attention, one should therefore focus on a positive future outcome. Example: "Stopping smoking will get you better at sports" (win) instead of "smoking is dangerous" (lose).

Heuristics: Cognitive biases

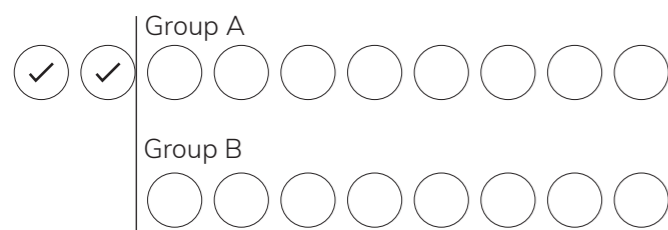


Figure 26: Endowed progress experiment with coupons. Same number of empty clips, but one group had 20% artificial progress and achieved higher completion.

Heuristics (Kahneman, 2011) are cognitive biases in decision making. There are many of these biases, but the one of the more useful in design is the endowed progress effect (Nunes, J. & Dreze X., 2006), where people/users are more likely to complete a task if they are provided with an artificial progress towards the task. An experiment showed 15 % improvement and faster completion for control groups with artificial progress. Design examples of this can be seen in the progress bars for instance on LinkedIn.

1. Duhigg, C. (2012) *The Power of Habit*,
2. Eyal, N. (2013) *Hooked: How to Build Habit-Forming Products*, Portfolio.
3. Fogg, B.J. (2016) *BJ Fogg's Behavioral Model* <<http://www.behaviormodel.org/>>
4. Seijts, G. et. al. (1995) *Goal Setting as a Strategy for Health Behavior Change*, Health Education Quarterly.
3. Kahneman, D. (2011) *Thinking Fast and Slow*,
5. Nunes, J. & Dreze, X. (2006) *The Endowed Progress Effect: How Artificial Advancement Increases Effort*, Journal of Consumer Research.
4. Artefact Group (2015) *Behavior Change Strategy Cards*.
5. Pink, D. (2009) *Drive: The Suprising Truth about what Motivates Us*.
6. Sharot, T. (2011) *The Optimism Bias: A Tour of the Irrationally Positive Brain*,

PSYCHOLOGIST WORKSHOP

Expert feedback

Although I gained knowledge from many well-established psychological theories, I thought it would be wise to get input from a professional in the field. Luckily, I was able to get in contact with one of Norway's leading experts on behavior change.

Jan Egil Nordvik has a Phd in Psychology from the University of Oslo, and leads the Competence-center for Rehabilitation at Sunnaas Hospital (Norway's foremost rehabilitation hospital). He coaches and teaches nurses and doctors about rehabilitation for patients.

Main Findings

"In regards to everything related to behavior change. **People are different, and what they are motivated by might change** from day to day, so **one has to use several motivation mechanisms.**"

Jan Egil

Insight: Multiple behavioral mechanisms should be used in a solution.

The meeting proved very useful for the project, where Jan Egil provided significant insight about rehabilitation theory and about different models used in healthcare.

"It is not possible to test someone's motivation possible through a survey. **If you ask people what they are motivated by, they will usually answer what is considered social norm.**"

Jan Egil

Insight: You cannot ask what people are motivated by, and get a reliable answer, but it might be possible to deduce through post-behavior analysis.



Fig. 29: Discussing different behavioral models.

Theory of Planned Behavior

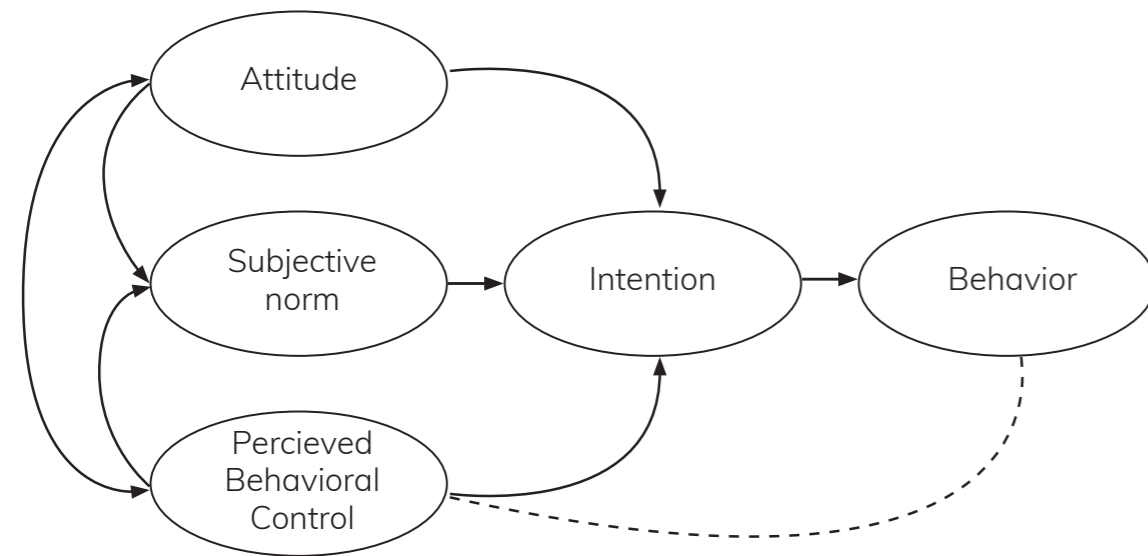


Fig. 30: Theory of Planned Behavior

“This model has been used by governments for many years and is behind the focus on preventive health information campaigns. **The weakness is that intention does not always lead to behavior.** We saw this in Norway when it was first when the smoking law came (Røykeloven) that led to a decrease in smoking, even though people had known it was dangerous for decades.”

Jan Egil

Insight: Intention and rational facts are not sufficient alone to cause behavior change for many people.

COM-B Model

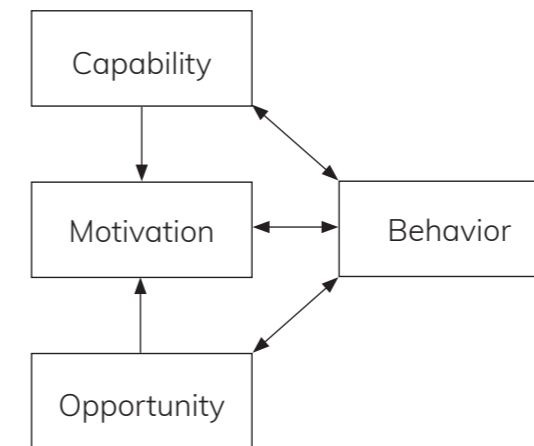


Fig. 31: Com-B model

“This model works well, because it shows that **behavior can only occur if there is a possibility for it. You have to see people in a historic, environmental context. You cannot leave all responsibility with the individual.** The only downside with this model is perhaps that it is too general.”

Jan Egil

Insight: A model should consider the capabilities of the individual and environmental factors, as well when looking at behavior.

Health Belief Model

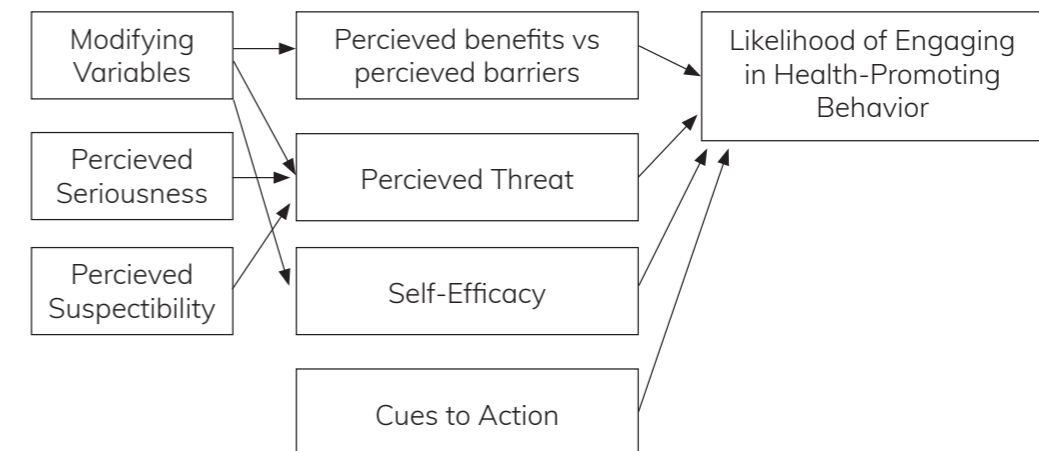


Fig. 32: Health Belief Model

“This is a good individual-focused model that shows many factors, but it also has the **weakness where intention does not always lead to behavior.**”

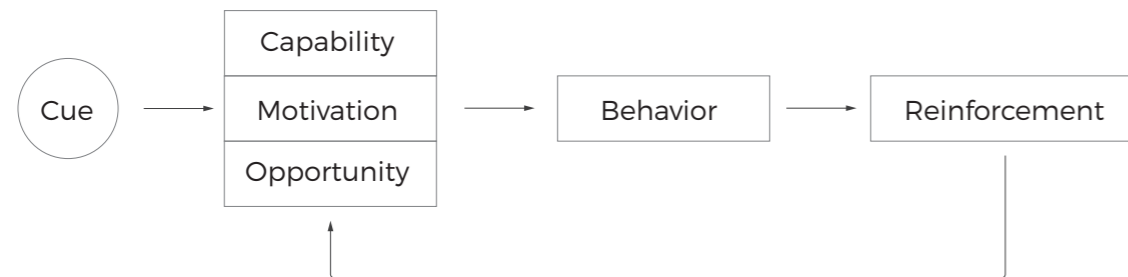
Jan Egil

Insight: The degree of health seriousness, chance of being affected, benefits and barriers, self-efficacy and cues are factors that can influence people's health behavior, but other factors may be important as well.

DEVELOPING A NEW MODEL

In order to find a general model for the concept, I ended up developing a new one. This is the second iteration of the model after feedback from Jan Egil Nordvik.

The Unified Behavioral Model (Erlandsen, HM. & Nordvik, JE., 2017)
The model, shortened as UBM, borrows from existing theories and consists of the following phases:



1. Cue

Is the spark (trigger) that activates the routine or behavior. Cues are divided into two categories: Internal (needs/feelings/urges) cues and external (environmental) cues. Internal cues are typically developed over time, through unconscious reward to outcome association.

2. Capability + Motivation + Opportunity

Capability: considers if the person is physically and mentally capable of the routine. Motivation: whether or not they want to. Opportunity: whether or not they have the possibility from the environment of doing the behavior. If these are not present, the behavior is unlikely to occur.

3. Behavior

Is the actual action or behavior that one wants to promote. It is through affecting all other elements in the model that behavior can be affected.

4. Reinforcement

Drives the capability, motivation and opportunity of the individual and can be both positive (rewards/accomplishment/positive experience/investment/consistence) and negative (punishment/failure/negative experience/cognitive dissonance). Negative reinforcement (punishment) is generally not an advisable behavior change method as people will only behave on the grounds of fear. In a solution one should try to maximize positive reinforcement, and vice versa.

Advantages

The model addresses some of the negative aspects with the other models previously shown. Unlike the linear models, it looks at repeat behavior (loop), and how behavior can be strengthened (reinforcement). However, unlike Dugg's Habit Model, the Hooked Model and Fogg's Behavior Model, UBM also considers factors outside the person's control (capability and opportunity) and negative reinforcement (not just positive rewards).

Other positive aspects of the UBM model, is that it is a general model that other models and theories can be integrated with, and that it can easily be used for behavior mechanism ideation as well as user journey mapping.

Disadvantage

The main disadvantage of the model, I am aware of so far, is that it is a general model, which means that it is less specific than for instance "the Health Belief Model." One way to counter this is to integrate more specific models into UBM.

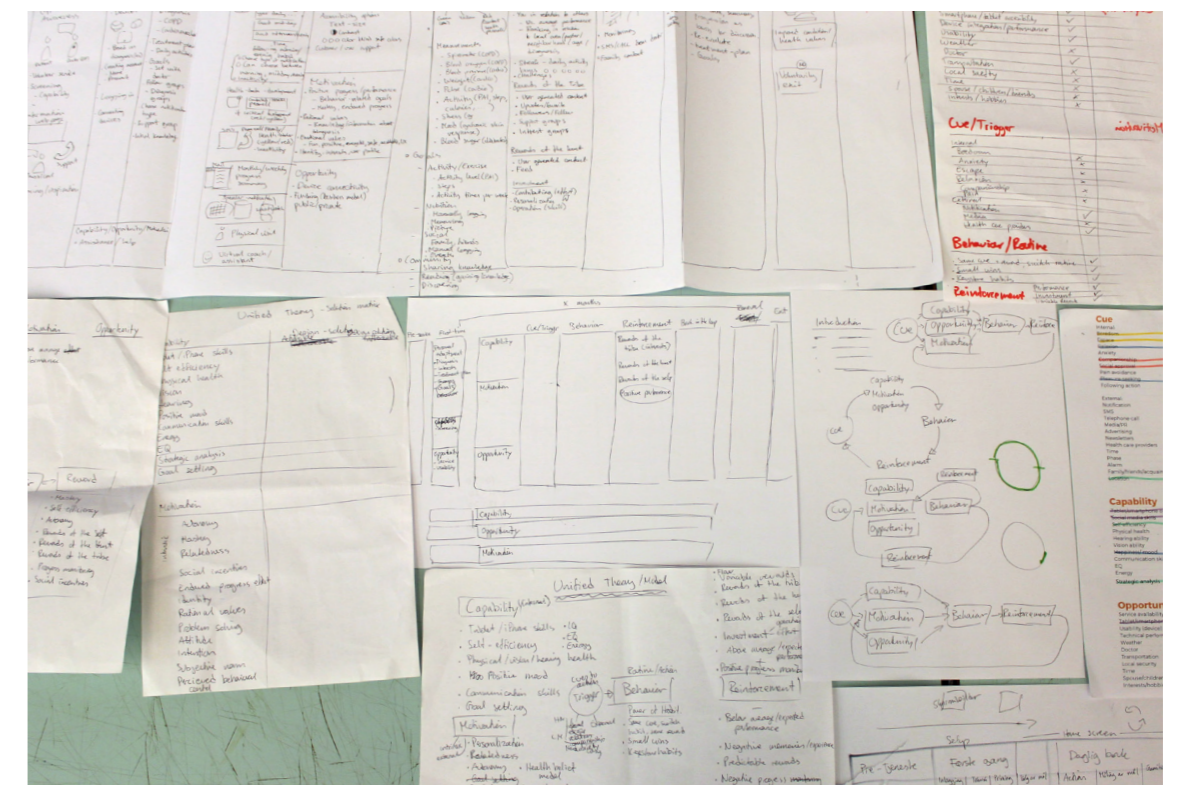


Fig. 33: Model development process.

The Unified Behavioral Model

The UBM Canvas

Cue Internal or external calls to action that trigger the behavior.	Capability Internal/personal psychological or physical factors	Behavior The way in which a person acts/performs. Also known as action, or routine.	Reinforcement Positive or negative strengthening of a pattern of behavior.
	Motivation Desire or willingness of the person to do something. Can be both intrinsic or extrinsic.		
	Opportunity External physical or social environment factors outside of the person's control.		

Fig. 34: The UBM canvas works well together with other behavior models/factors mapped onto it, as seen below.

The Unified Behavioral Model

<p>Cue Internal or external calls to action that trigger the behavior.</p> <p>Internal Following action/routine/habit</p> <p>Body signals</p> <ul style="list-style-type: none"> · Hunger · Lust · Anxiety · Anger · Impatience · Boredom · Desire stimulus · Sleepiness/tiredness · High energy <p>External Word of mouth People/friends/family Healthcare workers Advertising Media/news</p> <p>Notifications</p> <ul style="list-style-type: none"> · App icons · Newsletters · SMS · Phone call · Vibration · Sound · Alarm <p>Environment</p> <ul style="list-style-type: none"> · Climate/temperature · Location · Time of day 	<p>Capability Internal/personal psychological or physical factors</p> <p>Digital operation skills Communication skills Emotional Intelligence Happiness/mood Physical health Hearing ability Vision ability Movement ability Energy</p> <p>Motivation Desire or willingness of the person to do something. Can be both intrinsic or extrinsic.</p> <table border="0"> <tr> <td>Intrinsic</td> <td></td> <td>Extrinsic</td> </tr> <tr> <td>Autonomy</td> <td>Social norms</td> <td>Money</td> </tr> <tr> <td>Competence</td> <td>Percieved gain</td> <td>Status</td> </tr> <tr> <td>Relatedness</td> <td>Percived loss</td> <td>Praise</td> </tr> <tr> <td>Social acceptance</td> <td>Percieved risk</td> <td></td> </tr> <tr> <td>Identity</td> <td>Percieved control</td> <td></td> </tr> <tr> <td>Rational values</td> <td>Scarcity effect</td> <td></td> </tr> <tr> <td>Emotional values</td> <td>Anchoring effect</td> <td></td> </tr> <tr> <td>Attitude</td> <td>Endowed progress</td> <td></td> </tr> <tr> <td>Intention</td> <td>Seek pleasure</td> <td></td> </tr> </table> <p>Opportunity External physical or social environment factors outside of the person's control.</p> <p>Accessibility Affordance (money) Product/service usability Technical viability Weather Sufficient time Transportation Local security Interests/hobbies Spouse/partner/friends</p>	Intrinsic		Extrinsic	Autonomy	Social norms	Money	Competence	Percieved gain	Status	Relatedness	Percived loss	Praise	Social acceptance	Percieved risk		Identity	Percieved control		Rational values	Scarcity effect		Emotional values	Anchoring effect		Attitude	Endowed progress		Intention	Seek pleasure		<p>Behavior The way in which a person acts/performs. Also known as action, or routine.</p> <p>Goal of habit forming product is for the user to associate a reward (positive reinforcement) with a cue.</p> <p>To change a habit, keep the same cue and reward, but change action/behavior.</p> <p>Difficult to perform behavior = requires high motivation</p> <p>Easy to perform behavior = requires low/little motivation</p>	<p>Reinforcement Positive or negative strengthening of a pattern of behavior.</p> <p>Positive</p> <p>Positive performance Progress towards goal Momentum Flow (immersion) Problem solving Investment</p> <ul style="list-style-type: none"> · Time · Effort · Capability · Personalization Consistency · Values · Identity Variable Rewards · Rewards of the Hunt (Discovery) · Rewards of the Self (Development) · Rewards of the Tribe (Social) <p>Negative</p> <p>Negative performance Negative experience/memories Negative progress Cognitive dissonance Punishment Fines</p>
Intrinsic		Extrinsic																															
Autonomy	Social norms	Money																															
Competence	Percieved gain	Status																															
Relatedness	Percived loss	Praise																															
Social acceptance	Percieved risk																																
Identity	Percieved control																																
Rational values	Scarcity effect																																
Emotional values	Anchoring effect																																
Attitude	Endowed progress																																
Intention	Seek pleasure																																

UBM AS DESIGN TOOL

The useful aspect about the UBM canvas is that the different factors and phases can be used as a basis for ideation for a product or service.

To see how the UBM canvas was in this project, go to the next chapter: concept development.

Ideation questions

Which cues can our service/product contain to externally trigger behavior?

Does the user have the opportunity to buy/use the solution? Why? Why not? How is the business model structured? What are the restrictions? How does the user discover/gain awareness of the solution?

Which internal cues do we want the user to develop over time? What usage can the solution contain to give the user the intended internal association?

Which behavior do we want to occur? What behavior do we not want to occur? Should/will the behavior change through long-time usage of the solution? What do we do if the user stops using the solution?

What are the physical and mental capabilities of the user? How does the solution take this into account?

How can we use reinforcement-mechanisms to increase the likelihood of the behavior occurring? Which reinforcement mechanisms should we use?

What is the motivation of the user? Can we influence the motivation before, during and after using the solution?

Ethical considerations

What mechanisms/behaviors add value to the user's life? What mechanisms/behaviors negatively interfere/disrupt/annoy the user's life?

How do we know when the user becomes addicted, or a certain behavior goes too far? How do we avoid negative behavior?

Should any mechanisms be removed or used with care?

Cue	Influenceable	Design solution
Internal:	X	
Boredom	X	New content, social incentives
Espace	X	New content, social incentives
Relaxion	X	Calm tone & voice
Anxiety	X	Calm tone & voice
Companionship	X	Social incentives
Social approval	X	Social incentives
Pain avoidance	X	Get answers, calm tone
Pleasure-seeking	X	Fun, progress, activity
Following action	X	Link to existing habit
External:		
Notification	✓	Tablet/app/mail notification
SMS	✓	
Telephone-call	✓	Health-care worker
Media/PR	✓	
Advertising	✓	
Newsletters	✓	Email summary
Health care providers	✓	
Time	✓	Link to existing habit
Phase	✓	Link to existing habit
Alarm	✓	Link to existing habit
Family/friends/acquaintances	✓	Notify these
Location	✓	Link to habit, location notification

Capability	Influenceable	Design solution
Tablet/smartphone operation skills	✓	Tutorial, help, support, training
Social media skills	✓	Tutorial, help, training, FAQ, usability
Self-efficiency	✓	Achieving goals, positive progress
Physical health	Maybe	Positive progress
Hearing ability	X	To consider with sounds, VUI
Vision ability	X	Accessibility, text size, contrasts
Happiness/ mood	X	Positive tone & voice
Communication skills	X	
EQ	X	
Energy	X	
Strategic analysis	✓	Goal-setting

Opportunity	Influenceable	Design solution
Service availability	✓	Business model vs public funding
Tablet/smartphone accessibility	✓	Business model vs public funding
Usability (device)	✓	Interaction Design
Technical performance (device)	✓	Informatics/engineering
Weather	X	
Doctor	✓	Part of service
Transportation	X	
Local security	X	
Time	X	
Spouse/children/friends	X	Possibly include in service
Interests/hobbies	X	Appeal to existing interests

Motivation	Influenceable	Design solution
Autonomy	✓	Choose own goals, voluntarily service
Mastery	✓	Achieving goals, positive progress
Relatedness	✓	Show outcomes, threats, rewards
Social Incentives	✓	Forum, mentorship, chat, support groups
Endowed Progress	✓	10% progress bars
Identity	✓	Use personal history, Establish new identity
Rational values	✓	Knowledge, show outcomes,
Aeshetic values	✓	Desireable look&feel
Emotional values	✓	Safe, comfortable, happy, active
Anchoring effect	✓	
Scarcity effect	✓	Limited bonus
Attitude	X	Positive tone& feel
Intention	✓	Show what is possible, knowledge
Social norms	✓	Support groups, value campaign
Percieved behavioral control	✓	Best cases, knowledge, support groups
Percieved susceptibility	✓	Knowledge, social groups
Percieved benefits/barriers	✓	Knowledge, social groups
Percieved threat	✓	Knowledge, social groups

Behavior	Influenceable	Design solution
Hard to do = requires high motivation	✓	Analyse motivation + progress
Easy to do = requires less motivation	✓	Small wins, focus on easy goals

Reinforcement	Influenceable	Design solution
Positive reinforcement:		
Above average/expected performance	✓	Communication, realistic goals, progress goals
Positive progress monitoring	✓	Trend, graph
Investment (effort)	✓	Streak
Investment (time)	X	Time bonus/rank
Investment (operation skills)	X	Usability
Value consistency	✓	"You decided to stop."
Personalization	✓	Customize content, look, diagnosis
Variable Rewards:		
Rewards of the self (self-development)	✓	Leaderboard (postnr/rage/diagnosis), performance, points, badges, levels,
Rewards of the hunt (discovery)	✓	Feed, user/actor generated content, updates
Rewards of the tribe (social validation)	✓	Likes, followers,
Problem solving (challenge)	✓	Challenges
Flow (immersion) Small wins	✓	
Negative reinforcement:		
Below average/expected performance	✓	Avoid unrealistic goals,
Negative memories/experience	✓	Positive tone&voice, realistic goals
Predictable rewards	✓	Dynamic rewards
Negative progress	✓	Don't focus on development if negative progress
Cognitive dissonance	✓	

Fig. 35: Ideation based on fig. 34, to see what factors could be influenced and how.

4. CONCEPT DEVELOPMENT

Here I will present how I developed the concept based on the contextual research and behavior theory.

Content

UBM Mapping

Phase/Mechanism map

Wireframing

Testing

UBM MAPPING

UBM mapping as a method

As previously shown, the UBM canvas can be a great tool in order to ideate different ways a solution can use behavioral mechanisms.

UBM integrated in User Journey

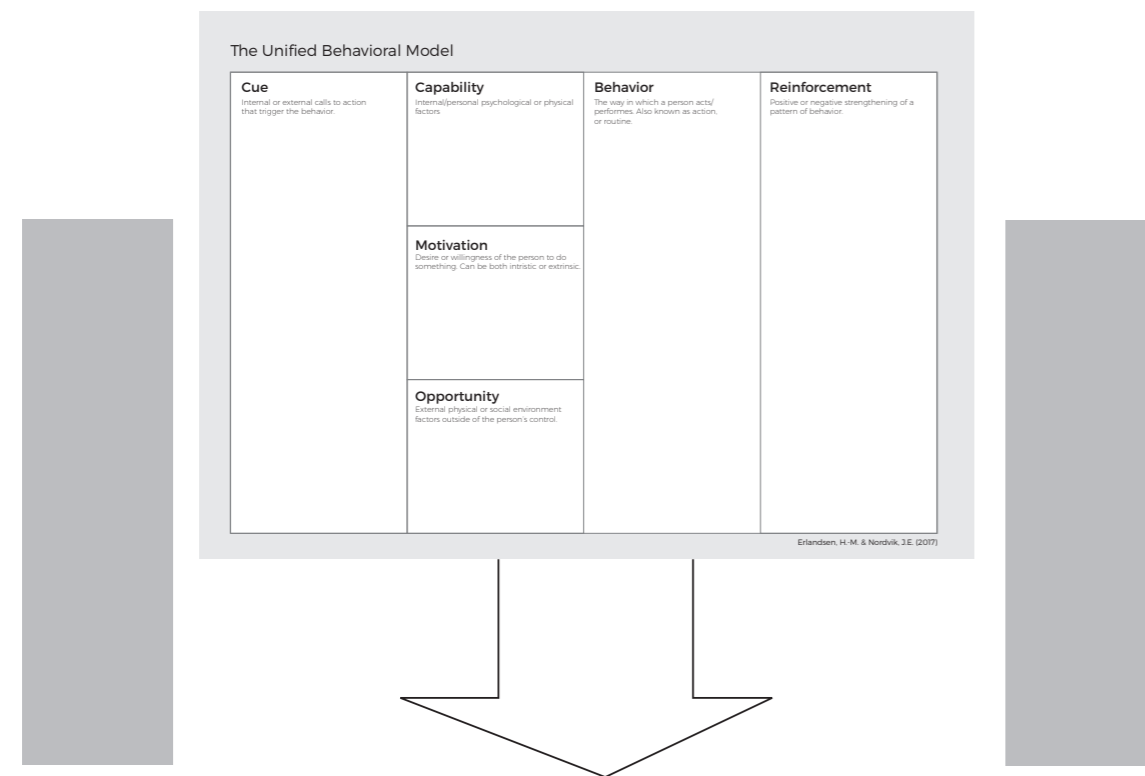


Fig. 36: The UBM phases can be integrated into a user journey and the method proves a basis map for first-time and daily usage of a solution.

The Experience - Opportunity Map

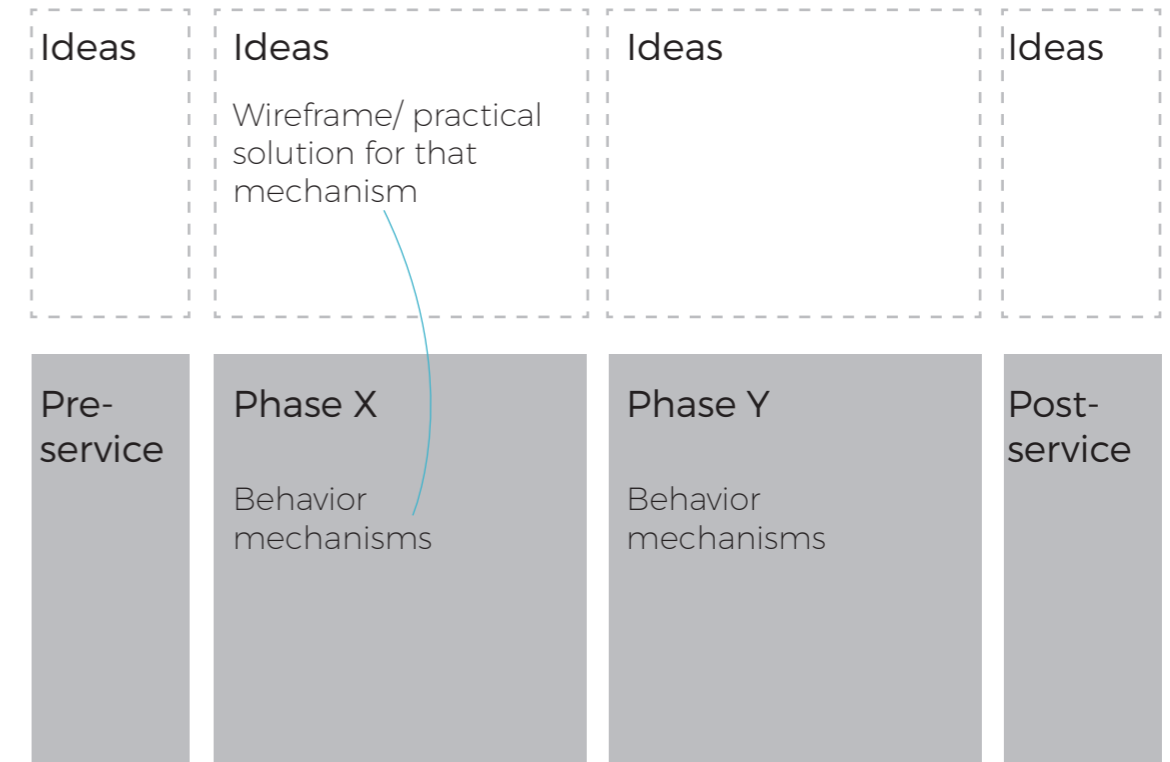


Fig. 37: I also developed a map, based on the user journey with UBM mechanics, in order to ideate on specific wireframes/designs.

First iteration

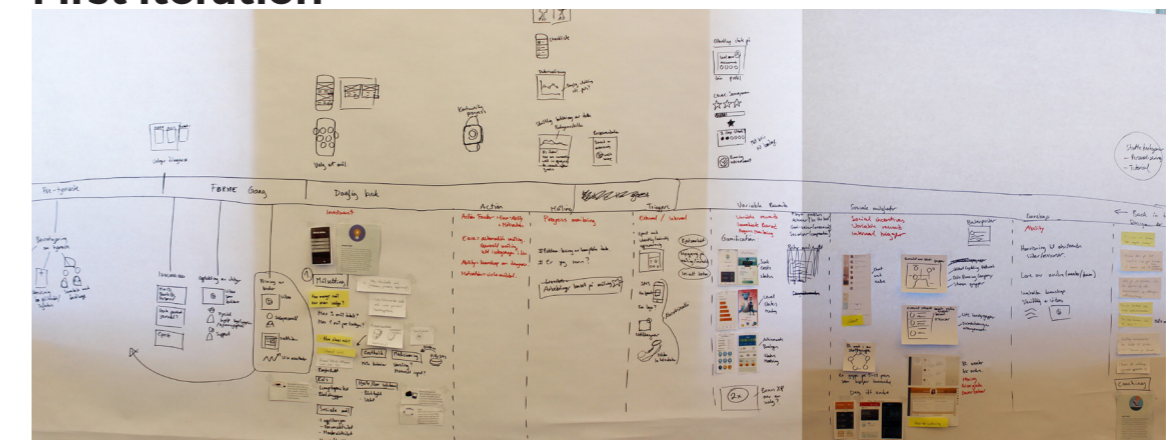


Fig. 38: First iteration of the Experience - Opportunity map.

Vej et mål.

Daglig brug

Investment



1. Målsetting

hvilke mål
har man velge?

Max 3 mål totalt?
Max 1 mål pr kategori?

- Hvilke slags mål?

konkret mål

Personal Ability
score over 100

Respekt

Kals

Lungekapitet
Blodtryk

Hjerte/kar system

Blodtryk
Vekt

Sosiale mål

1 applikation
Forumaktivitet
Mentoraktivitet
familie

Kosthold

Måltid
Måltid
Måltid

Medicinering

Medicinering
Medicinering
Medicinering

Smartphone

hvilke indikatorer skal
man vælge?

Legitimerede mål
med vis persent,
kvalitetsmåling

Personalevnen
Personalevnen
Personalevnen

Smartphone

Action

Action Factor = Effektivitet + Motivation

Effektivitet = objektivitet, uafhængig
Generel uafhængig
Uafhængig i sig selv

Ability = kendskab om omgivelserne
Motivation = indre middel

Mål

Progress måling

Uafhængig måling af omgivelserne
Uafhængig måling af omgivelserne

Uafhængig måling af omgivelserne

Uafhængig måling af omgivelserne

Priming av
bønder

Udvalgte

Udvalgte

Udvalgte

Udvalgte

Second iteration

This iteration of the Experience-Opportunity map, the printed information is based on the first map, and the drawings are new ideas. Though a little complex to explain to other people, it was possible to get feedback from others on the phases, mechanisms, and specific ideas. This proved to be a useful concept development tool, but I learned the need to create a simplified map for communication.

Wireframes

Handwritten notes and sketches on a whiteboard:

- Konsept #1:** Lærings oppgaver med oppgaver (50-100 minutter)
- Konsept #2:** Situasjonsoppsett (60-90 minutter)
- Konsept #3:** Direkte rapporting mellom pasient og helsearbeider (Bakgrunn / Diagnose (Anamnese))
- Tren 2 ganger i uken i 1 måned, 100-150 min**
- PAI score har vært dag på 70-80 ppm**
- Tren 2 ganger i uken i 1 måned, 100-150 min**
- PAI score har vært dag på 70-80 ppm**
- RESPONSIVE ELEMENTER**
- VELGJE PALETT + FOLGEBLØTT**
- TUTORIAL OPPKOBING**
- Diagnose Physical level**
- SWIPE**
- OPPLÆRINGS UKE/MÅNED EPST**
- Algoritme ser at balansen er i dårlig form + lite aktivitet / prøver seg**
- ⇒ Forstår enkle mål**
- Overordnede sosiale mål**
- 17% bruker**
- Hi-Tone! Det er en skandale at du har trent 2 ganger i uken i 1 måned. Hva skal du gjøre? Du skal være mer aktiv og bruke mer tid på å trene. Du skal være mer aktiv og bruke mer tid på å trene.**
- SMS oppkobling positiv tone**
- Antebefalinger**
- Basert på resultat**
- Utdelt**
- 5-års oppfølging**
- Offentlige slott på din profil**
- Overordnede sosiale mål**
- 5-års oppfølging**
- Støttestruppe for "Inne"**

Pre-tjeneste

Første gang

Daglig bruk

Back in the game

Opportunities

Pre-tjeneste	Første gang	Daglig bruk	Back in the game
Bevisstgjøring Bruker oppdager tjeneste selv Anbefaling/henvisning fra fastlege Anbefaling/henvisning fra poliklinikk/sykehus Anbefaling/henvisning fra kommune	Priming Nettside Video Helsepersonell forklarer Markedføring	Inlogging MiniID BankID BuyPass Hente pasientjournal Epost + passord SMS Google Facebook	Design for error Hva skjer hvis brukeren har negativ utvikling? Mindre fokus på det som er feil Med fokus på hvordan å forbedre situasjonen OBS: Alarmguide må forhindre at brukeren blir mast på Hva om bruker ikke er aktiv? Triggers Coaching Fastlege/helsearbeider + telefon Fastlege/helsearbeider + besøk
	Oppkobling av utstyr Video Support Fysisk hjelp	Personlig tilpassing Investment Velge diagnose Tilpasse fysisk nivå Tilpasse utseende Bli med i grupper Følge temaer	
		Mål og måling Autonomy, investment, personlig tilpassing Hvor mange mål skal kunne velges? Maksimalt 3 mål Maksimalt 1 mål per kategori Ukevisning Hva slags mål? Generell helse Personal Activity Intelligence (PAI) Røykeslutt Sønn Stressnivå Kosthold Måle kalorier Måle inntak Hjerter/kar sykdom Blodtrykk Vekt Sosiale Mål I applikasjon Sosial aktivitet (forum/mentor) Venner/familie Ta kontakt Inviter på besøk	
		Triggers Call to action Eksterne Oppsummering av uke/måned SMS Til fra helsearbeider Besøk Home screen Inti Nysgjerrighet Sosiale behov Tidsfordriv (kjedsomhet) Status/anerkjennelse	
		Action B = MAT behaviour = motivation + ability + trigger Motivasjon Måle aktivitet/motivasjon Tilpasse utfordringer Ability (Kunnskap) Henvisning til eksisterende ressurser Lære av andre Inneholde nyttig info	
		Progresjon Progress monitoring Anbefalinger basert på måling Tekst-basert tilbakemelding Metafor tilbakemelding Fremdriftsplan Tone/voice/ touch&feel	
		Variable Rewards Rewards of the Self (Gamification) Achievers Mastery, progress, completion Levels, likes/points/XP Achievement, badges Social, mastery Bonus Window of opportunity Sosiale incentiver (The Tribe) Social incentives, connectedness, meaning, status, guru Chat Mentorer Startegrupper Oppretts/likes/favorites Interessegrupper Brukerposter Rewards of the Hunt Discovery, curiosity Feid med nytt innhold Tasse/vekke rydgjerrigheten	

PHASE/MECHANISM MAP

	Pre-service	Onboarding			Daily Use				Support		Post-service
	Eligibility	Awareness	Capability Motivation Opportunity	Setup	Cue	Capability Motivation Opportunity	Behavior	Reinforcement	Follow-up	Monitoring	Exit
Behavior Mechanisms	<p>Diagnosis</p> <ul style="list-style-type: none"> • COPD • Cardio-vascular <p>Secondary user group:</p> <ul style="list-style-type: none"> • Danger zone 	<p>Awareness</p> <ul style="list-style-type: none"> • GP • Web • Media/PR <p>Voluntarily service (autonomy)</p> <ul style="list-style-type: none"> • Accept ToA & monitoring <p>Business Model</p> <ul style="list-style-type: none"> • Private • Public 	<p>Priming</p> <ul style="list-style-type: none"> • Initial interest <p>Screening</p> <ul style="list-style-type: none"> • Cognitive skills • Digital skills <p>Social incentives</p> <ul style="list-style-type: none"> • Join support group <p>Rational/ideological values</p> <ul style="list-style-type: none"> • Show benefits of service <p>Aesthetic values</p> <ul style="list-style-type: none"> • Fun, positive, energetic • Calm, safe, trustworthy <p>Emotional values</p> <ul style="list-style-type: none"> • Appeal to personal identity • Discover interests 	<p>Create account</p> <p>Logging in</p> <ul style="list-style-type: none"> • MinID • BankID • BuyPass <p>Connecting to devices</p> <ul style="list-style-type: none"> • Automatic data transfer (principle of laziness) <p>Treatment-plan</p> <ul style="list-style-type: none"> • Together with nurse/doctor <p>Autonomy</p> <ul style="list-style-type: none"> • Choose goals <p>Customize</p> <ul style="list-style-type: none"> • Follow tags/people/groups • Time of daily cue • What device(s) to get notifications 	<p>Internal cues:</p> <ul style="list-style-type: none"> • Anticipation • Variable Rewards <p>External cues:</p> <ul style="list-style-type: none"> • Following existing habit • Morning routine • Lunch • Evening routine <p>Notification</p> <ul style="list-style-type: none"> • Health critical/negative development <p>Notification guidelines</p> <ul style="list-style-type: none"> • Don't stress user when negative development • Notification settings <p>Notification devices</p> <ul style="list-style-type: none"> • Smartphone • Tablet • Wearables • Smart speaker • SMS 	<p>Accessibility</p> <ul style="list-style-type: none"> • Color blindness • Reduced vision <p>Help</p> <ul style="list-style-type: none"> • Support <p>Usability</p> <ul style="list-style-type: none"> • Walkthrough 	<p>Stick with treatment-plan</p> <ul style="list-style-type: none"> • Medicine • Exercise • Lifestyle <p>Measurements COPD:</p> <ul style="list-style-type: none"> • Spirometer • Blood Oxygen <p>Cardiovascular:</p> <ul style="list-style-type: none"> • Weight • Pulse • Activity <p>Complete goals</p> <ul style="list-style-type: none"> • Physical activity • Nutrition • Social <p>Contribute to community</p> <ul style="list-style-type: none"> • Share knowledge • Gain knowledge 	<p>Positive performance</p> <ul style="list-style-type: none"> • Behavior related goals <p>Avoid negative performance</p> <ul style="list-style-type: none"> • No medical goals • Notification guidelines <p>Progress monitoring</p> <ul style="list-style-type: none"> • Data visualization • Text description <p>Rewards of the Tribe (Social)</p> <ul style="list-style-type: none"> • Approval (favorites) • Help others (meaning) • Sharing <p>Rewards of the Hunt (Discovery)</p> <ul style="list-style-type: none"> • User Generated Content • News <p>Rewards of the Self (Development)</p> <ul style="list-style-type: none"> • Positive progress • Competition (Challenges/ranking) 	<p>Use daily life data as basis for discussing with GP</p> <p>Re-evaluate treatment plan/goals</p>	<p>Cloud/automatic data monitoring</p> <p>Notify operator/monitorer if patient health is outside normal ranges.</p> <p>Call/SMS patient</p> <p>Patient notification guidelines (avoid stress)</p> <p>Notify family/friends</p> <p>Data-analysis</p> <ul style="list-style-type: none"> • used for analytics/big data • used in research/pattern recognition 	<p>Voluntarily exit at any time</p> <p>Exit on improved condition/Health</p> <p>Return equipment (if borrowed)</p>
Touchpoints		<p>Media/PR</p> <ul style="list-style-type: none"> • Website with information <p>General practitioner</p>	<p>Mail GP User Interface</p>	<p>User Interfaces</p> <ul style="list-style-type: none"> • Smartphone • Tablet • Desktop • (Future: voice) 	<p>Period summary</p> <ul style="list-style-type: none"> • Weekly • Monthly • Period 		<p>Medical devices</p> <ul style="list-style-type: none"> • Spirometer • Blood oxygen • Weight • Pulse 	<p>Period summary</p>	<p>Expert (GP) interface:</p> <ul style="list-style-type: none"> • Desktop GUI • Mobile/tablet <p>Period Summary</p>	<p>Monitoring interface:</p> <ul style="list-style-type: none"> • Desktop GUI • Mobile/tablet <p>Home Nurse</p>	

WIREFRAMING

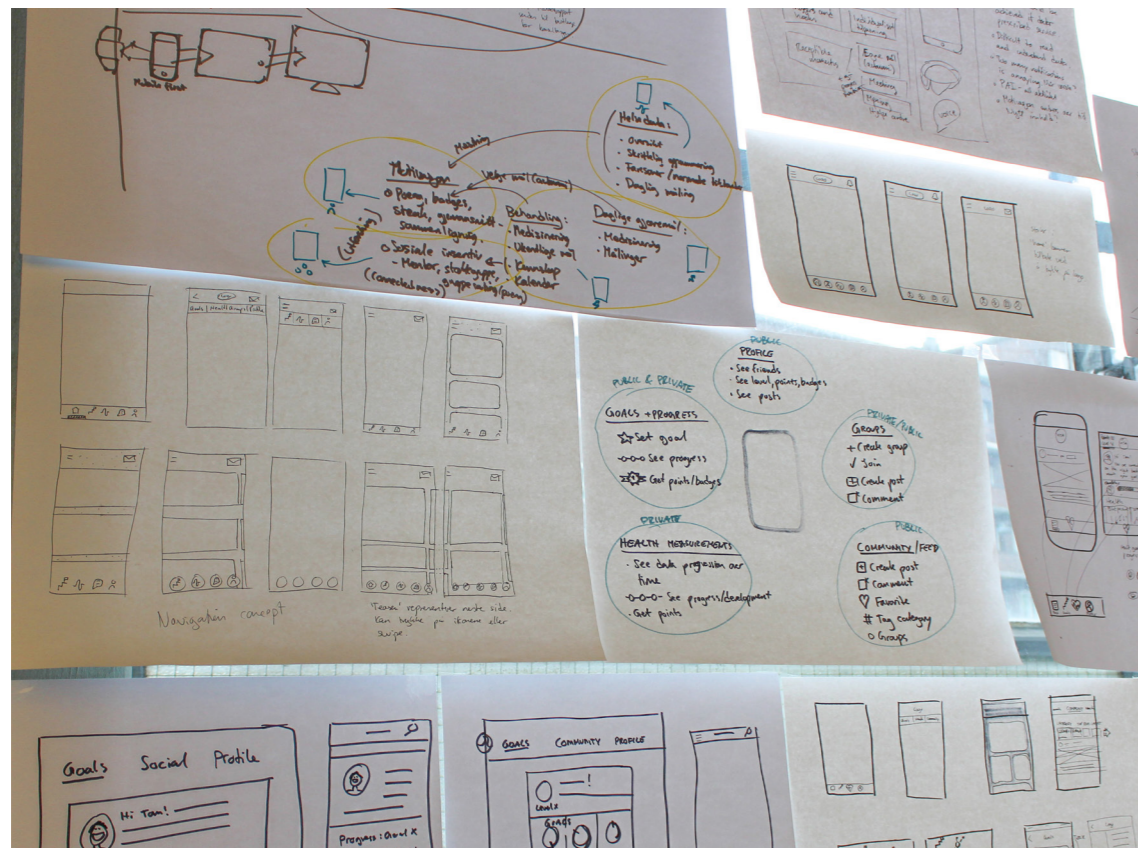


Fig. 39: Early ideation

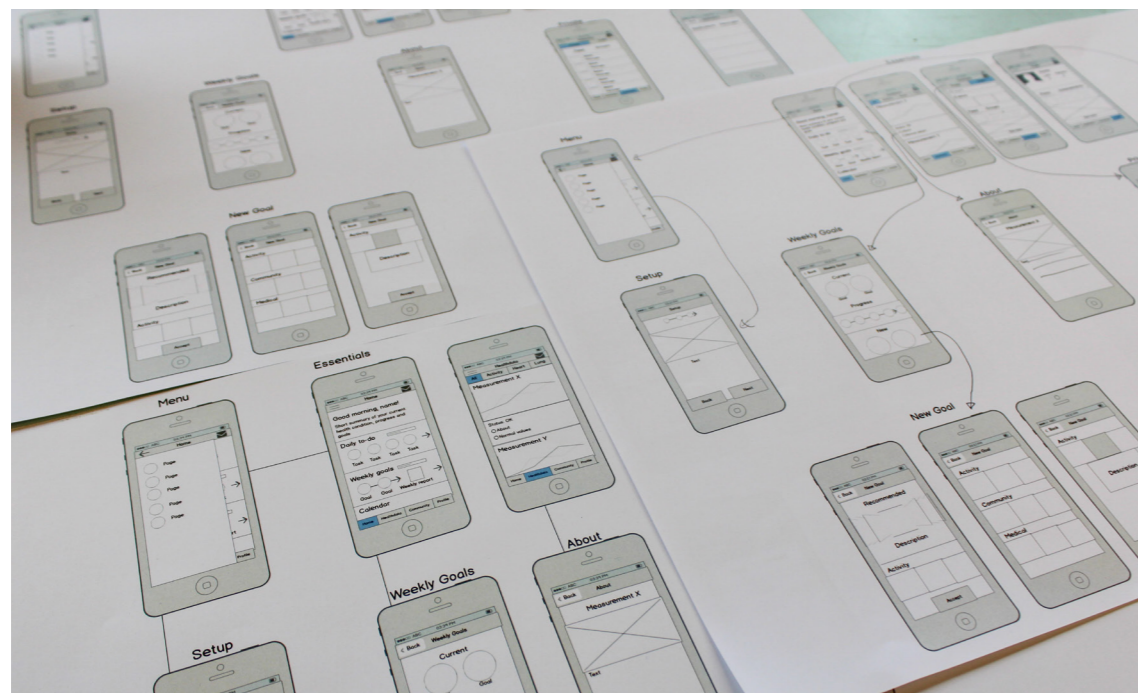


Fig. 40: Navigation & information architecture.

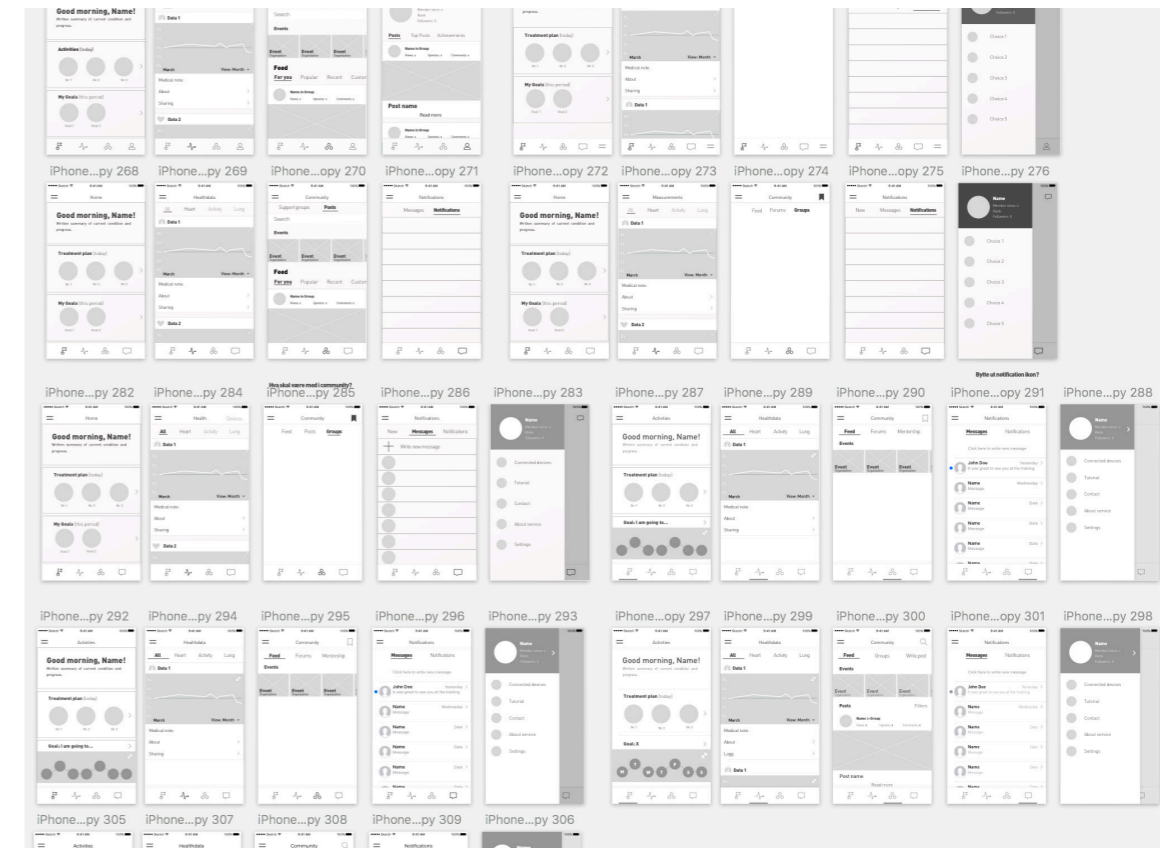


Fig. 41: Flow and detailed grey-scale wireframes.

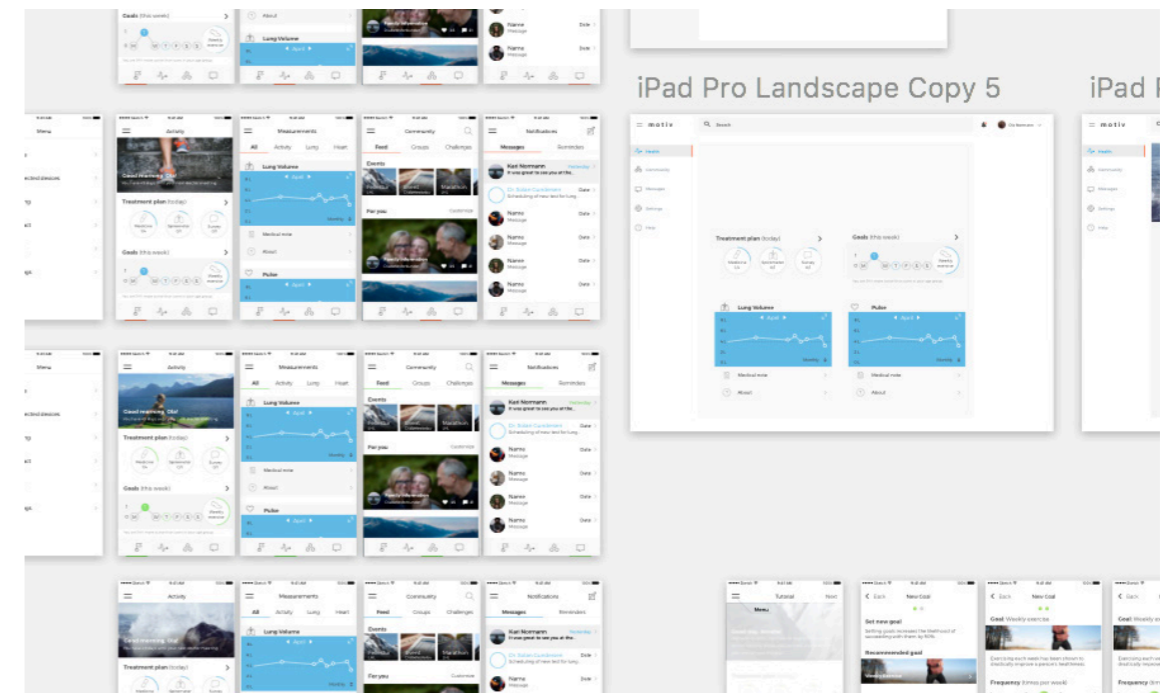


Fig. 42: High fidelity wireframes with colors, icons and images.

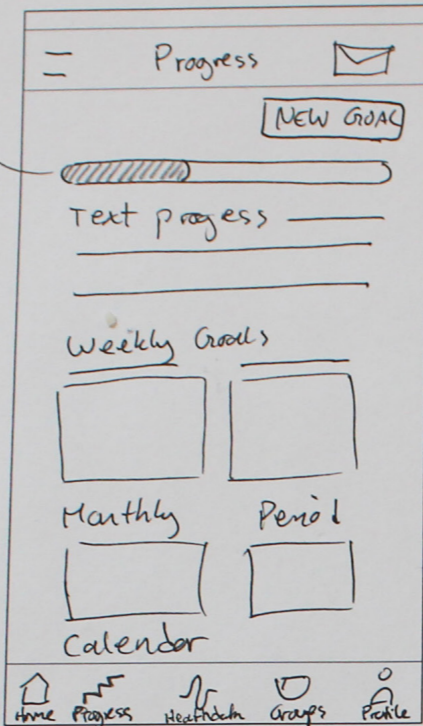
Summary-card



Add progress-bar

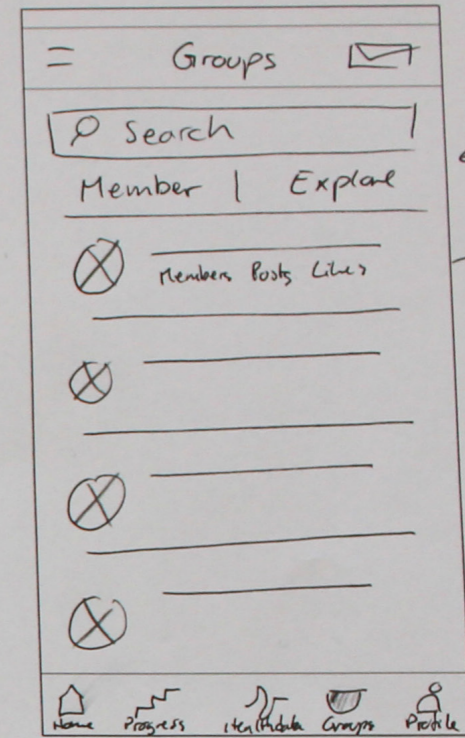
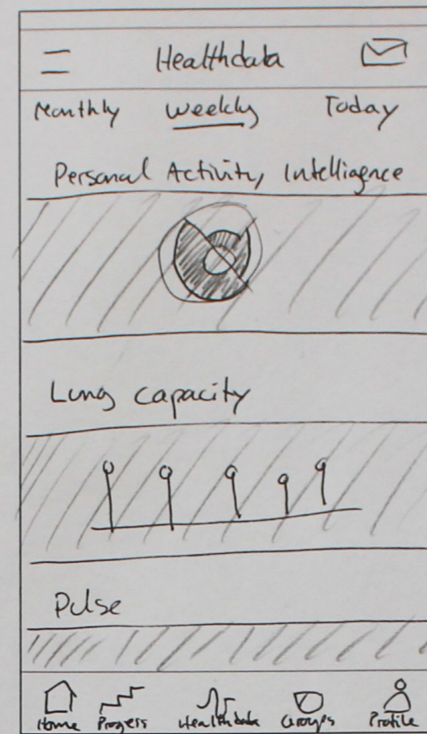
Balanceability

Menu stays in top of screen when scrolling down.



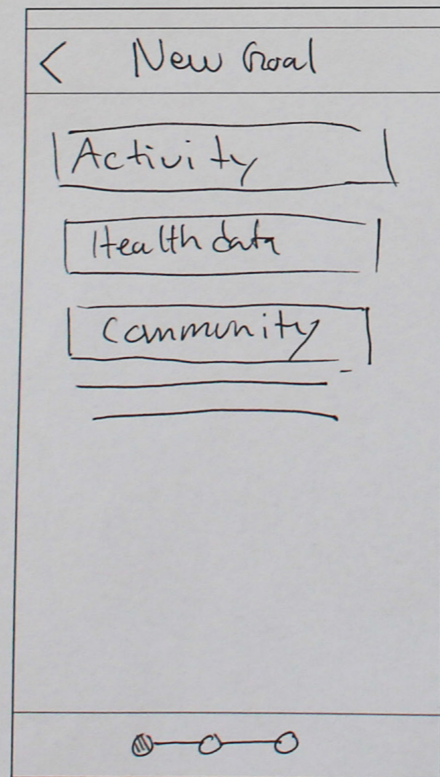
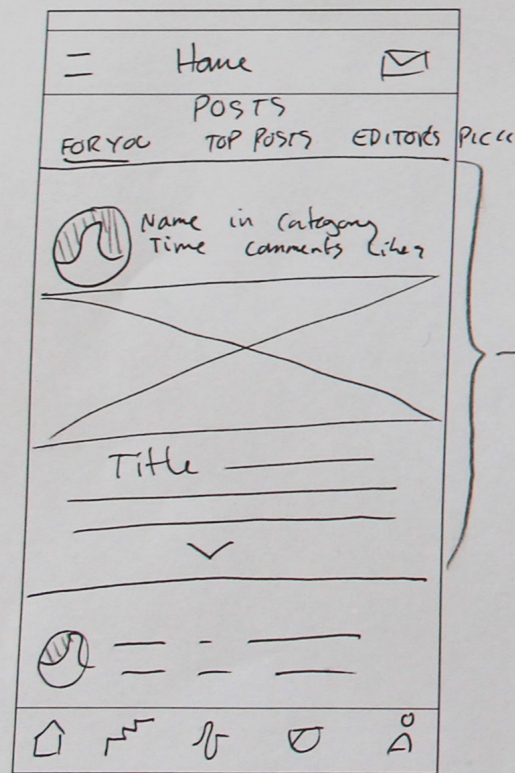
Hva skal progressbar være basert på

Hva skiller weekly, monthly og period goals? Hvordan lenge alle sammen?



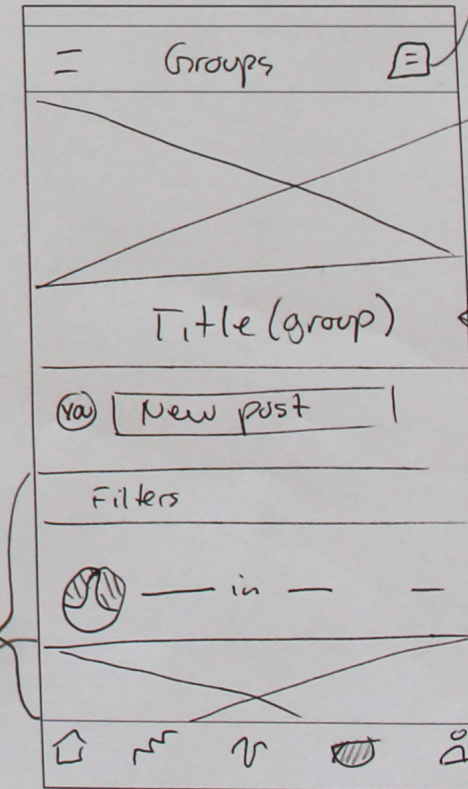
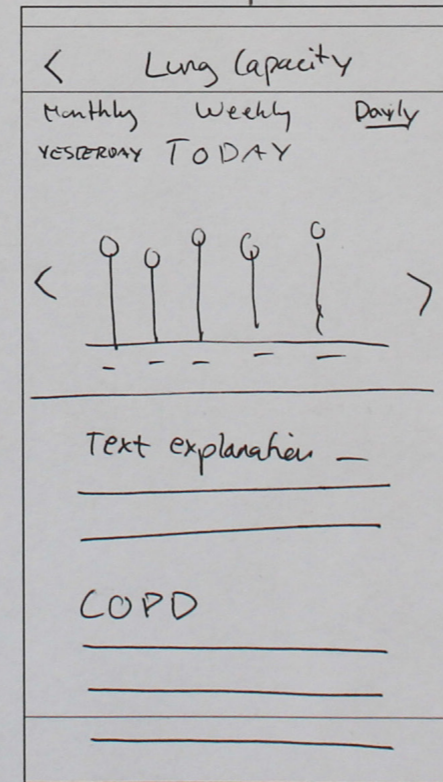
Ostlo, Norway

Skille mellom privat og offentlige



Mer plass til bilder og tekniske tekst.

Hva er neste steg i new goal.



Mer moderne enn bevilan?

Bodymarked Resources

Events

Et støtte-grupper/mentor

TESTING

Though testing prototypes I was able to test the usability, navigation and aesthetics of the design solution. The users were also overall very positive to the design concept of a digital home rehabilitation service.

Engagement challenge

I learned that it is difficult to get reliable feedback on the behavioral mechanisms. In order to discover how solution works when it comes to long-term engagement, it actually has to be implemented and to some degree used over some time, which was hard to do with this project.

If a real version of the solution had been developed it would have been possible to measure the effectiveness of the different behavior mechanics, through post-use analysis or AB-testing different versions. No doubt some changes would have been made to the design concept if it had gone through a few long-term engagement testing iterations.

Still, with the final delivery building on top of a well-established theoretical fundament, I believe that it is likely that the concept is nearer a working solution, than for instance an agile process without the framework.

Identity match

Initially, the solution had some obvious gamification elements (points, levels, badges) that some users responded negatively to. "I am not a type of person who is interested in games. This is too childish for me." one user said. Whether or not that is actually true (as Nordvik said, people often are not aware of what motivation mechanics work for them) is hard to asses.

What one can deduce is that some people have a bias against certain elements, possibly because it does not resonate with how they see themselves. I believe that if these elements are toned down to become less conspicuous, they could possibly still be used without the user experiencing a negative response.

For the final design, I still use some gamifications elements like badges and counting favorites/followers (could also be considered a social media element), but made them more discrete.



Fig. 43: Early testing of main navigation elements.

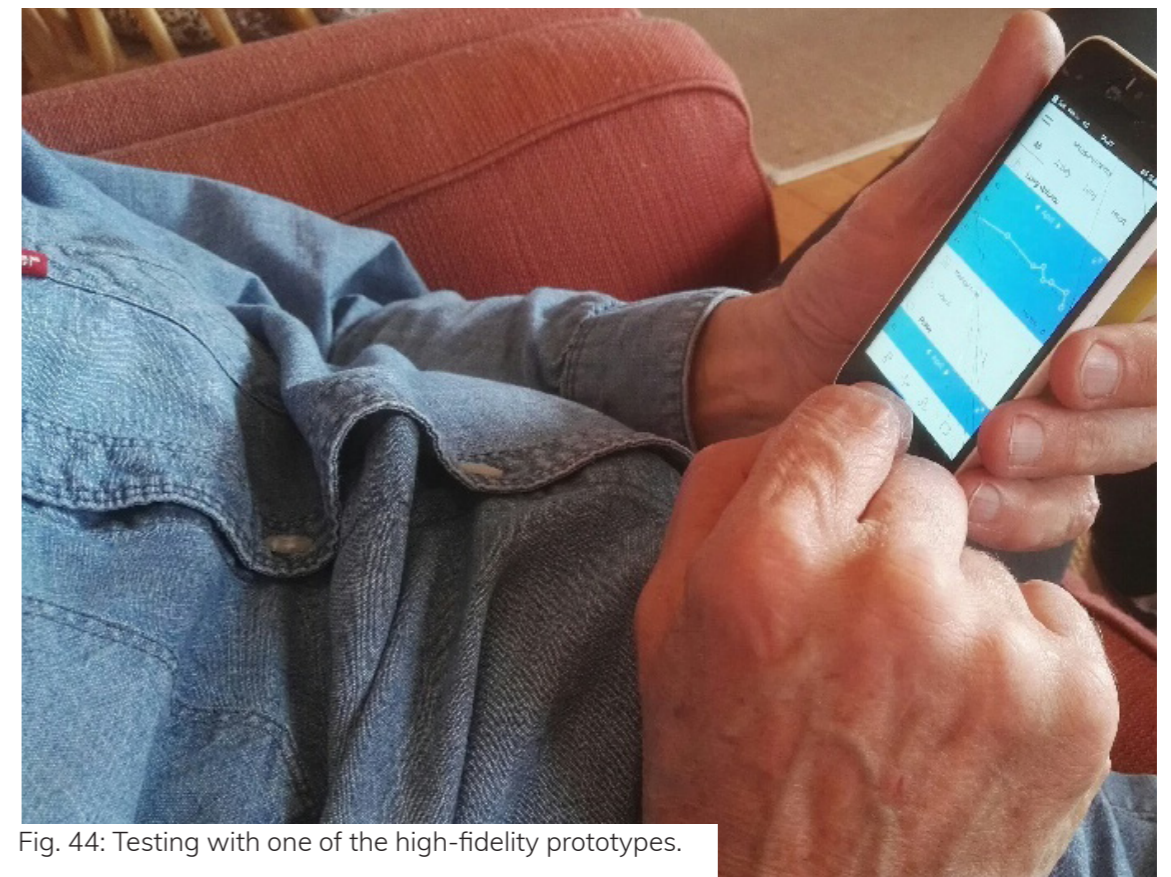


Fig. 44: Testing with one of the high-fidelity prototypes.

5. DELIVERY

In the following pages, the most important features and design decisions from the delivery will be presented.

Content

Design Proposal

User Journey

App Overview

Daily Use: Home screen

Daily Use: Treatment overview

Daily Use: Goals

Daily Use: Community

Daily Use: Cue

Onboarding: Setup

Onboarding: Opportunity

Onboarding: Capability

Use Contexts

Information Architecture

Mobile Navigation

Grid

Iconography

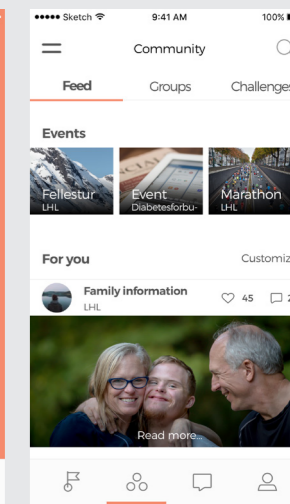
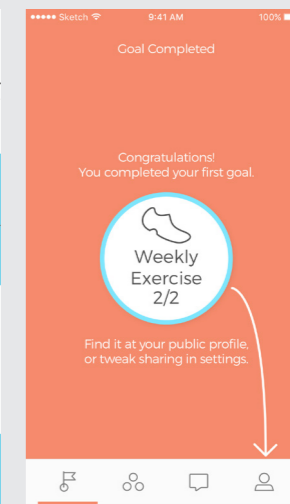
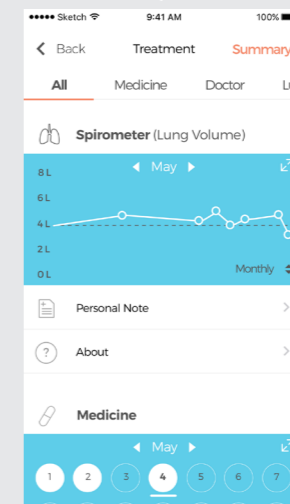
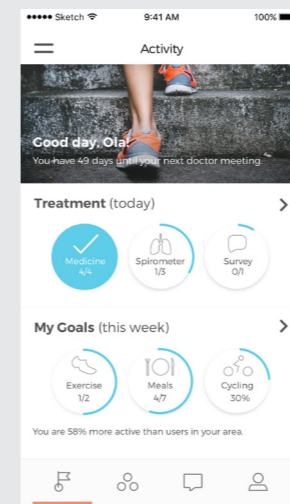
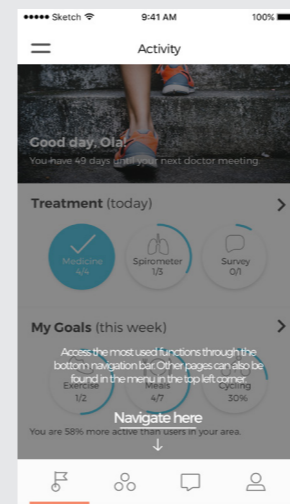
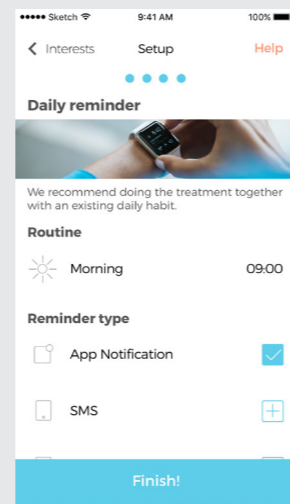
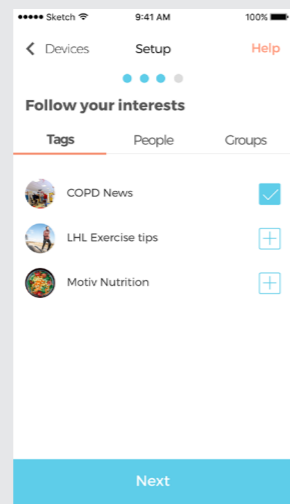
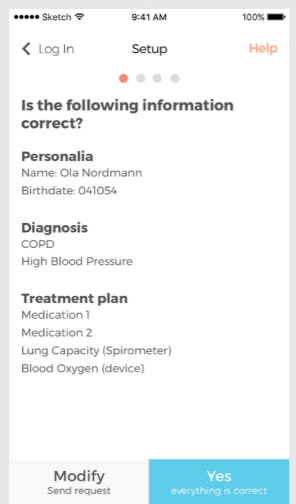
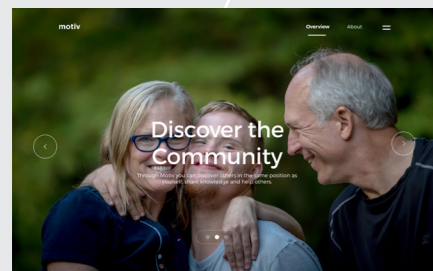
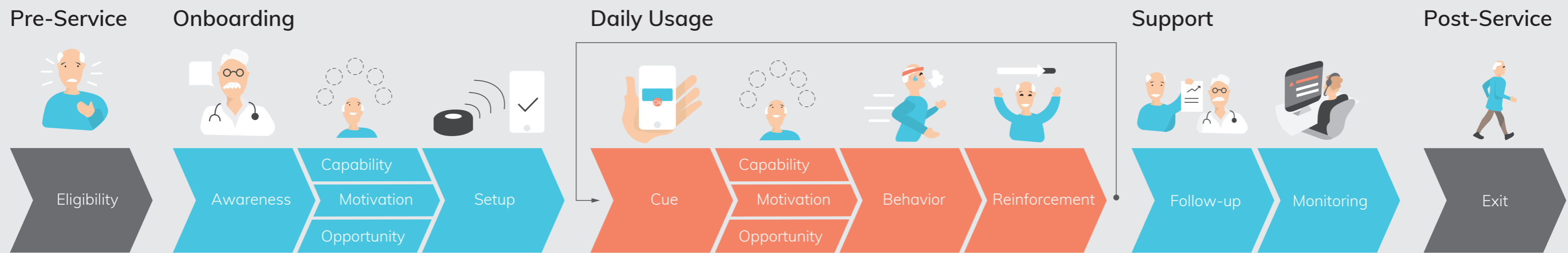
Visual Identity

Prototype

Feedback: Final Iteration

DESIGN PROPOSAL

Motiv is a service that aims to improve rehabilitation and promote healthy living for patients with COPD or cardiovascular disease, through an engaging digital platform. Both the service and the interaction design is based on the Unified Behavioral Model, shown in the previous chapters.





USER JOURNEY



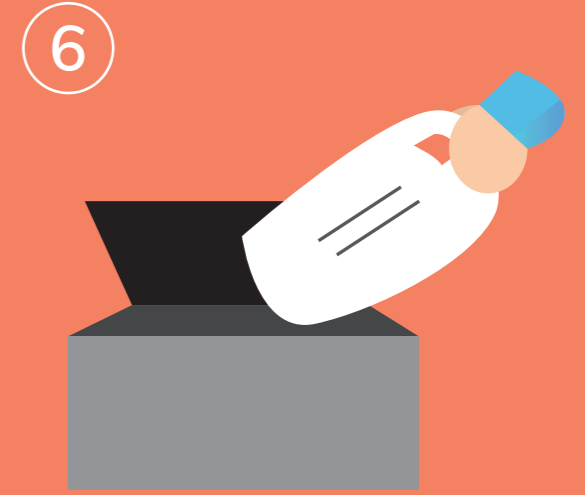
1 Ola (59) lives alone and has a physically inactive lifestyle.



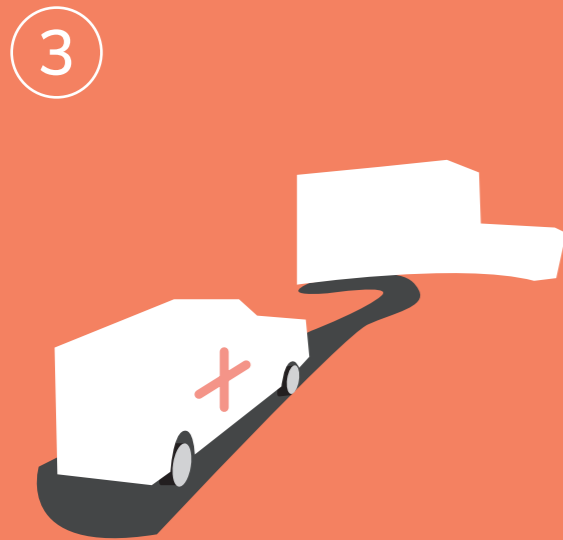
2 One day at work, he suddenly experiences a heart attack.



5 At first, Ola is not so sure about this service and decides to think about it. Luckily he can find more information about it online.



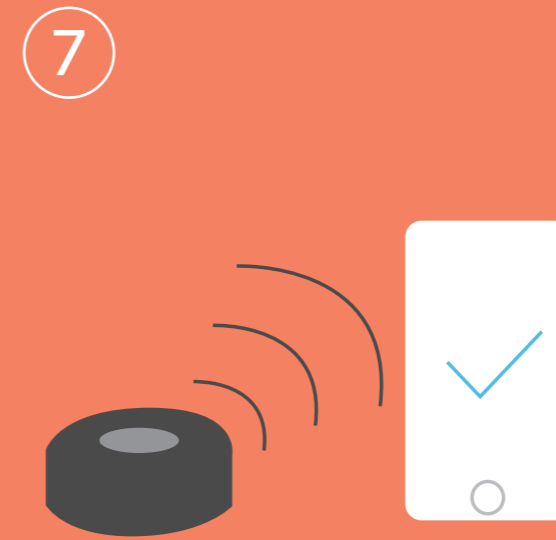
6 After deciding to try the service, he gets sent the different medical devices he needs in the mail, and downloads the app.



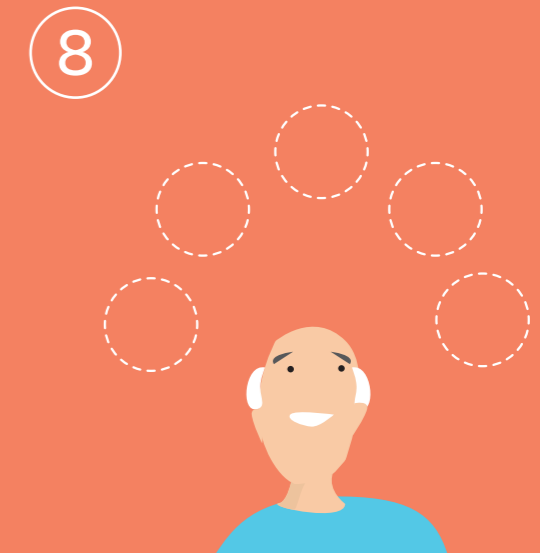
3 He is rushed to the local hospital and gets bypass surgery.



4 After recovering from his operation, his general practitioner says that he needs to change his lifestyle to avoid further complications. The doctor recommends the service Motiv.



7 After logging in, the application imports his treatment plan from helsenorge, and helps him connect the different devices together.



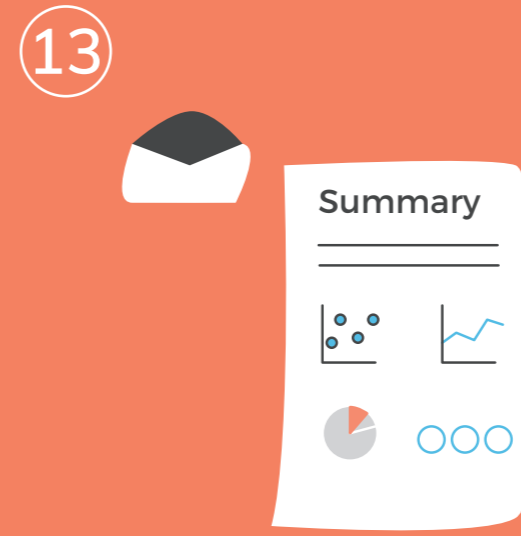
8 Ola tailors the application to his liking, by setting personal goals and following groups and people about cardiovascular disease.



9
Ola has customized the application to remind him each morning to perform the measurements. Data is automatically uploaded.



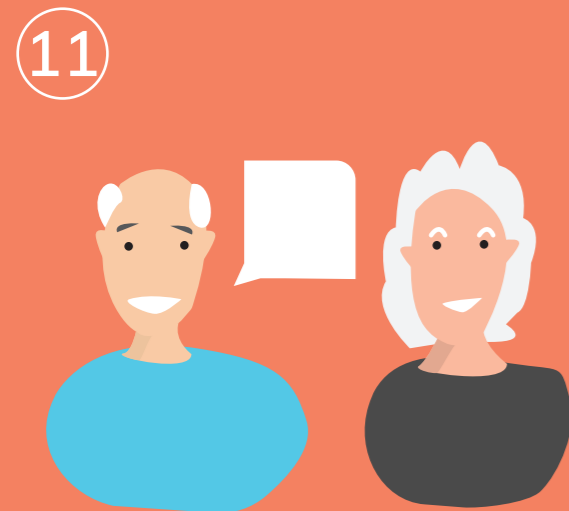
10
Days later, an algorithm warns one of the service operators, that Ola's blood pressure has risen. The operator calls Ola, who also was aware of the problem. The system notes the call, so the next operator does not immediately call again.



13
After a few months, Ola gets notified, that his next meeting with his doctor is coming up. He is shown a summary of his data and it is also stated he only has a few weeks left to make any changes before the report is finalized.



14
By achieving the goals in the application, Ola's confidence has improved. He is proud of having concrete data showing how he has committed to the treatment plan and that he has completed harder challenges.



11
At first Ola did not pay much attention to the social aspects of the application, but he starts liking to read about other people's experiences. This becomes a regular reason why he checks the application after a while.



12
Although it has taken some time, through the tracking, goals available resources, Ola has started exercising and eating healthier. He feels inspired and continues to set new goals. Contributing to the community also gives him a good feeling of helping others.



15
At their next meeting, Ola and the doctor discusses the data from Ola's life during the last few months. With actual data of how his treatment is performing in his daily life, they can re-evaluate the treatment plan.

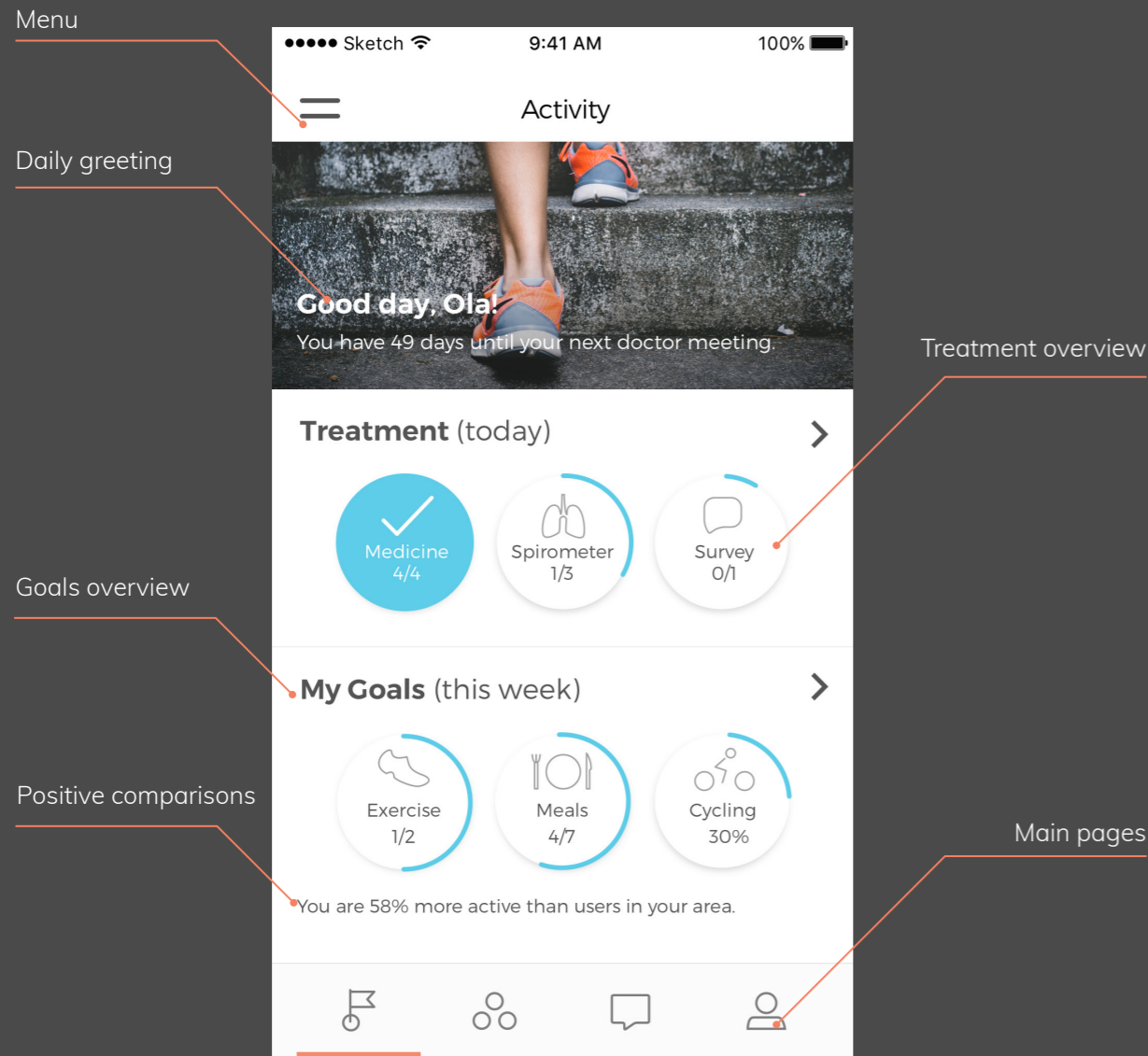


16
After a few cycles of using the service and meeting the doctor, Ola's condition has improved sufficiently that he chooses to leave the service. He returns the medial equipment he borrowed. Though, he knows that he can always come back.

APP OVERVIEW



DAILY USE: HOME SCREEN



Glanceability

For the easy accessibility and situational awareness, the treatment plan and daily goals are always visible on the first "home" page of the application. As these are primary functions of the application, they should be fast to check when the user opens the application.

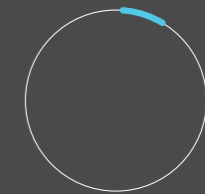
The treatment-plan and goals are automatically updated and progress is shown as the user performs the tasks. This makes it easy to see how one is doing in each day and in regards to the weekly goals.

Daily Greeting

The top banner of the home page serves several functions. The greeting, image and message differ from day to day, which makes the application more intriguing and less predictable to check daily. The image and the message itself also add to the app's tone and feel by containing inspiring images and useful information.

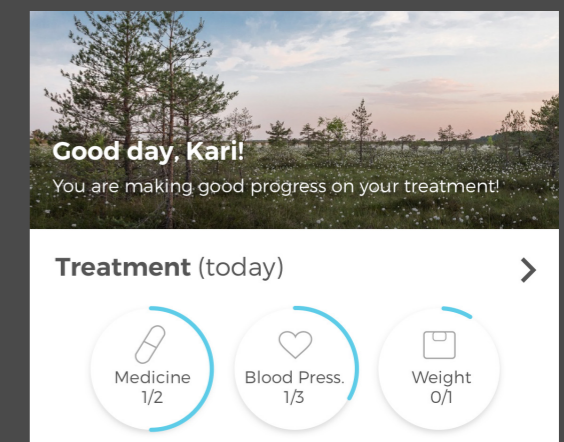
Endowed Progress

The endowed progress effect is used on the progress wheels to give the impression of having started the tasks.

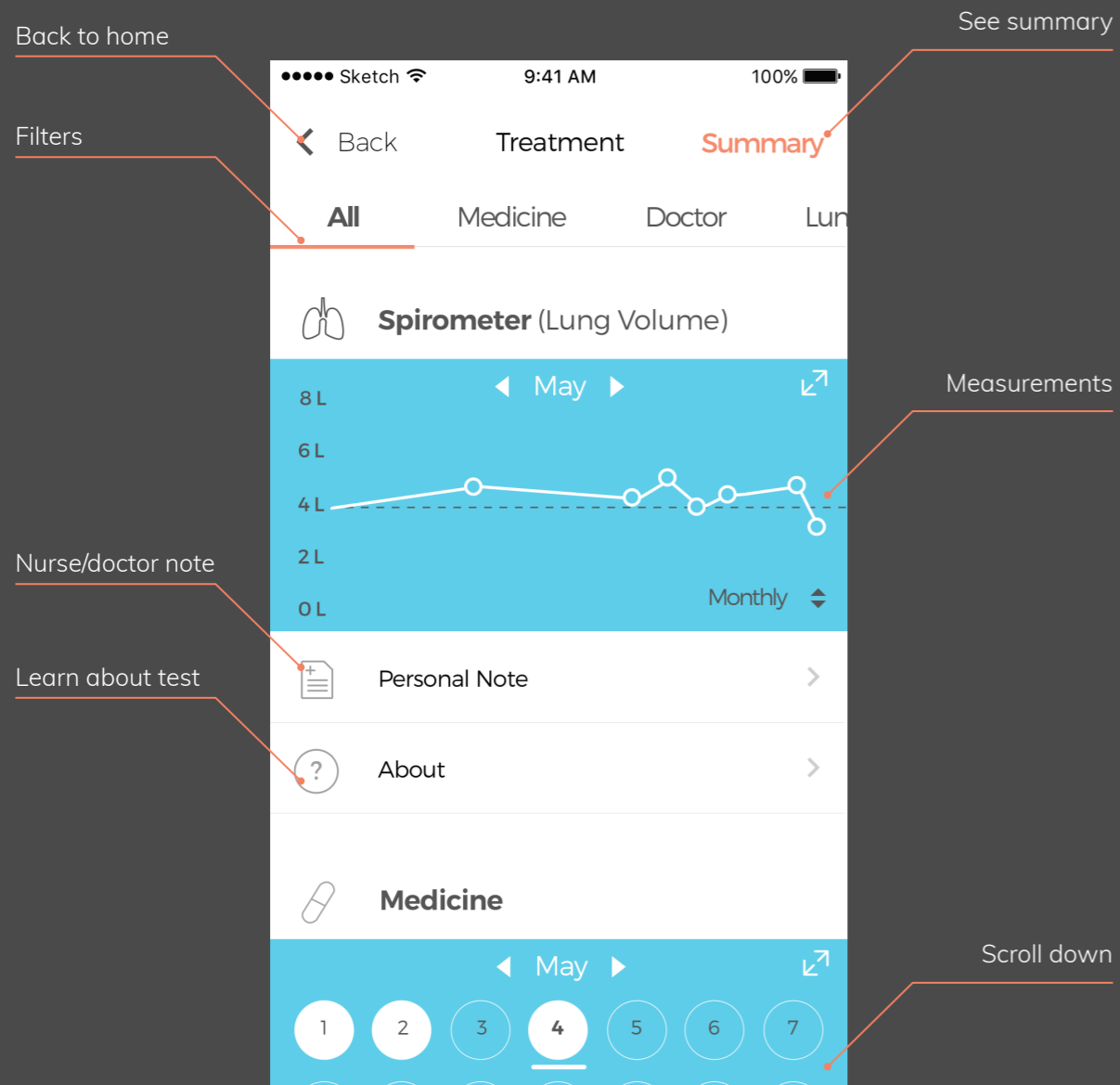


Personalized

Treatment plans differ greatly from patient to patient both in scope, measurements and complexity. Below is an example of how it could look for a different patient with cardiovascular disease.



DAILY USE: TREATMENT OVERVIEW



How to deal with negative progression?

One of the challenges is when the measurements gradually become worse, as happens with lung capacity and COPD. Nonetheless, for COPD patients, exercise can decrease the negative lung development and improved heart strength can boost their physical condition.

Some measures are included in the design to reduce the stress with negative development:

- A calm blue/white graphical communication of these medical measurements aims to soothe the user.
- The user can learn more about the test itself if they desire (About).
- Nurses/doctors can add notes that explain what measurement values are normal for the user and their expected progression (Personal Note).
- The monitoring interface should log each time the user is contacted, to avoid contact-overload, in order stress the user as little as possible.
- The goal-setting in the application (shown later) is not related to medical values, as they are also influenced by factors that can be outside the user's control.

Treatment statistics

Over time, by doing the daily measurements, the data generates statistics that can show the progress of the user.

The treatment overview page shows more detailed statistics, than the home page, on how the different measurements are progressing.

Summary report

By clicking/tapping "Summary" it is possible to view a preview of the period summary that the doctor will be able to see at their next meeting.

Monitoring

As shown in the user journey, these measurements are also monitored remotely. The monitoring system can also notify an operator and health personnel if the user does not adhere to their treatment-plan.

DAILY USE: GOALS

Behavior-related Goals

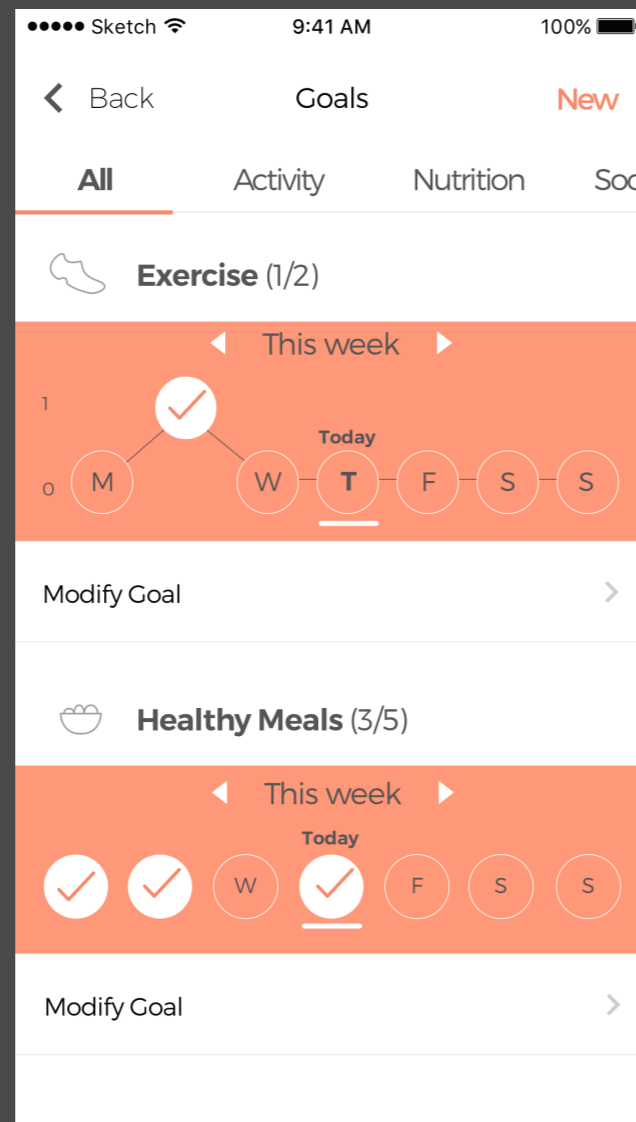
As shown in the "behavior design" chapter, goal setting has been shown to be an effective strategy that increases strategic analysis (analysis by the person of how the goal is accomplished), and increases the likelihood of the user reaching the goal.

Initial intent is needed in order for the user to want to achieve the goal. Therefore, all the goals are individually chosen (SDT: autonomy) by the user when they want.

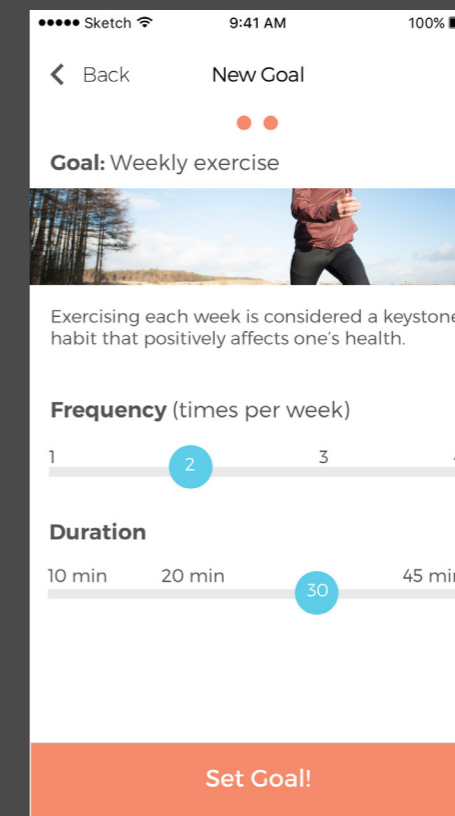
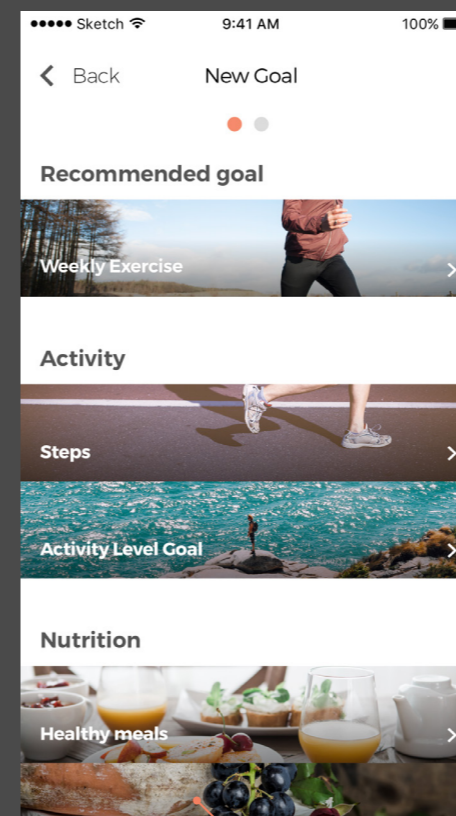
It is paramount that the user has the highest possible chance of reaching their goals, because failing a goal is a negative reinforcement on motivation, and vice versa (SDT: mastery). Therefore, goals should not be related to medical values, as those are also affected by factors outside the users' control. Instead goals should just have the performance dependent on the user's behavior.

Reinforcement

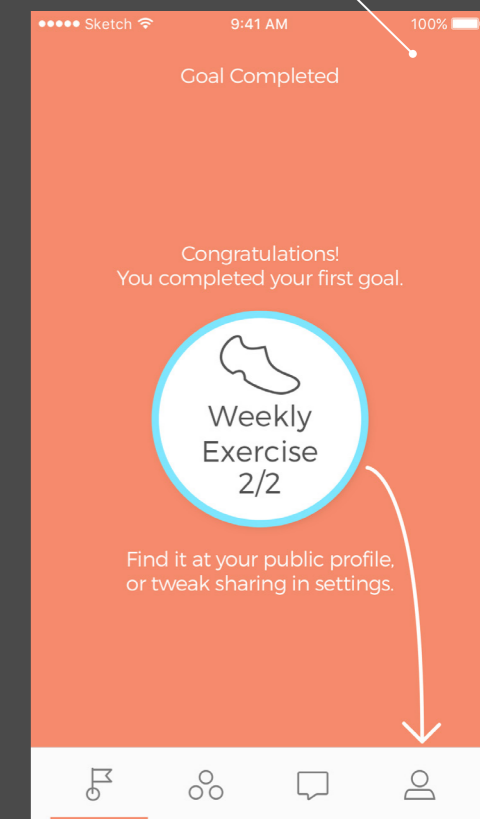
Completing goals will make them appear on the summary sent to the doctor. In addition, certain goals yield badges that are shown off on the users' public profile for bragging rights (social incentives).



Setting new goal

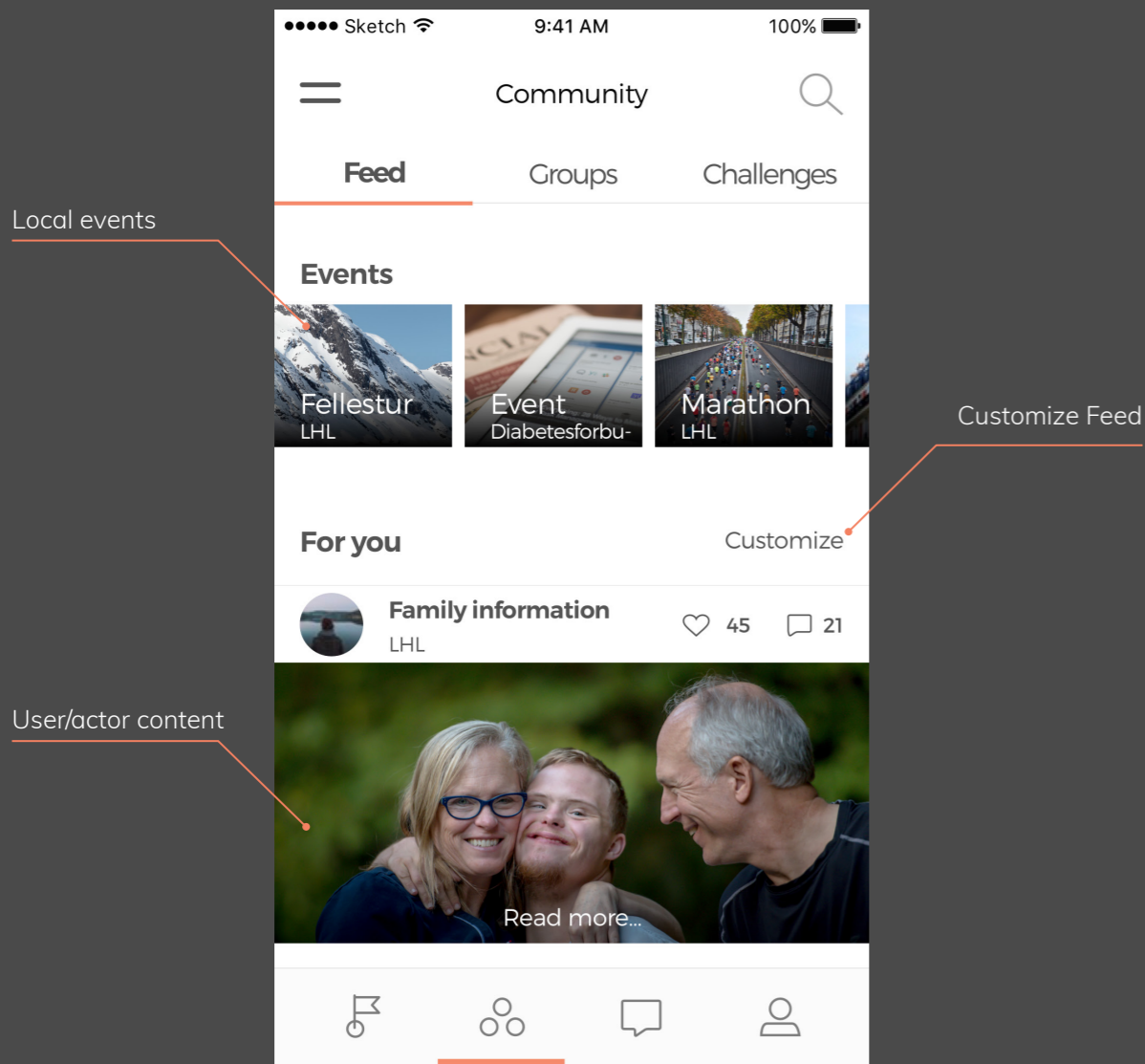


The goal section has orange instead of blue as the main color, compared to the treatment section, in order to inspire and be energetic.



Goals are divided into four main categories: activity, nutrition, social and custom.

DAILY USE: COMMUNITY



Social Incentives

"Our brains are adapted to seek rewards that make us feel accepted, attractive, important and included." - Nir Eyal

As humans we desire to feel connectedness with other people and much of our behavior is based on social needs like companionship and social validation.

Meeting and sharing experiences through support networks, has been used with success for many different diagnoses and conditions. This was also a central finding from the contextual research phase, where both users and experts spoke of the need for human connection.

Through Motiv, it is possible to find and join groups where one can share and help each other (SDT: relatedness). Helping other people in a similar situation may provide the users with a feeling of mastery, and being able to contribute (meaning).

Variable Rewards

Another benefit of user/actor generated content is that it is constantly updated, which makes the experience unpredictable. Over time, this can manifest itself for the user an internal cue, where they check to see if there is anything new (rewards of the hunt). These rewards are often driven by curiosity and the desire to uncover the unknown.

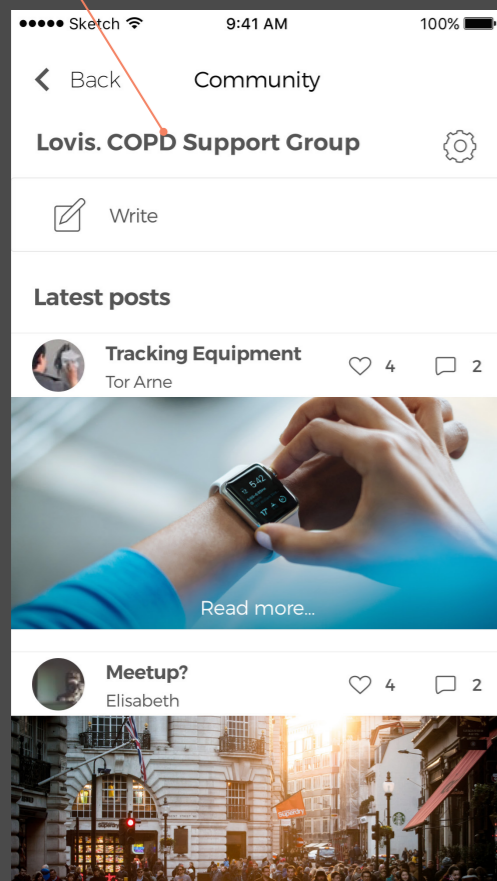
Personalize

Initially when setting up the application, and later if the user wants, they follow tags, groups and people that provide useful/interesting content/information for them.

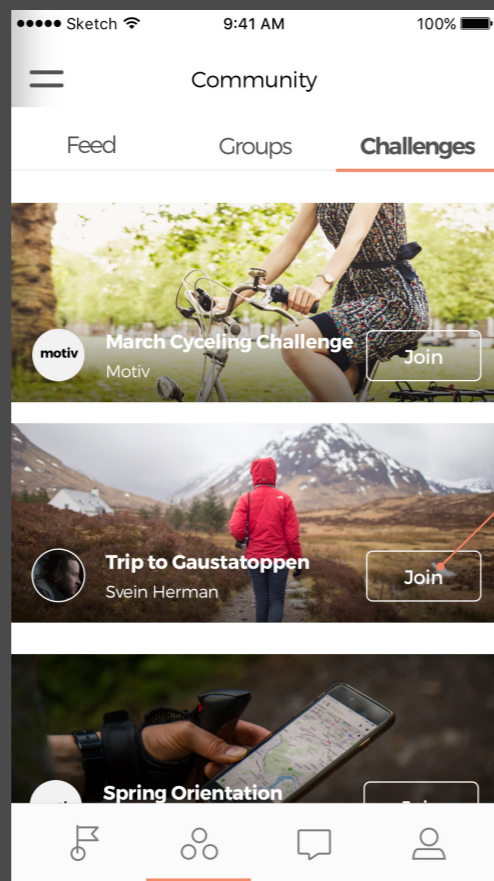
This personalization (investment & autonomy) increases the value of the product, as the user has invested effort in it (reinforcement). This feed becomes a useful area to expand the knowledge of their condition, through information provided by patient organizations and other users.

Support network

Group

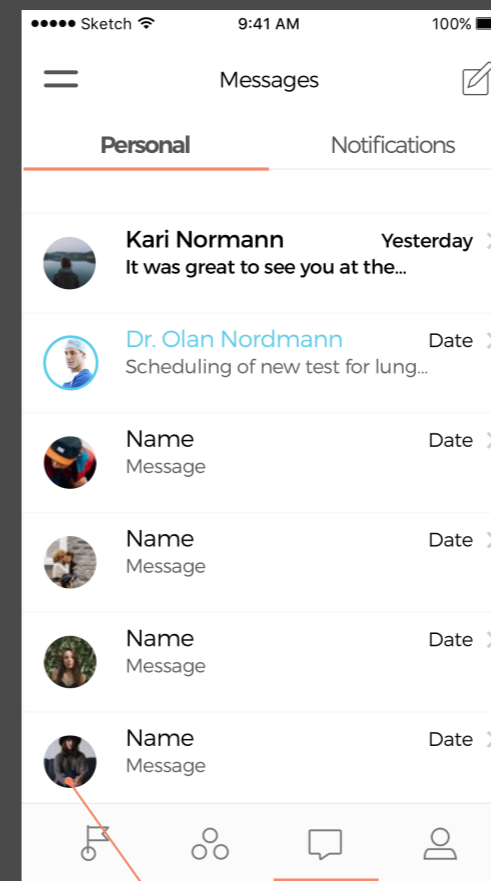


Challenges



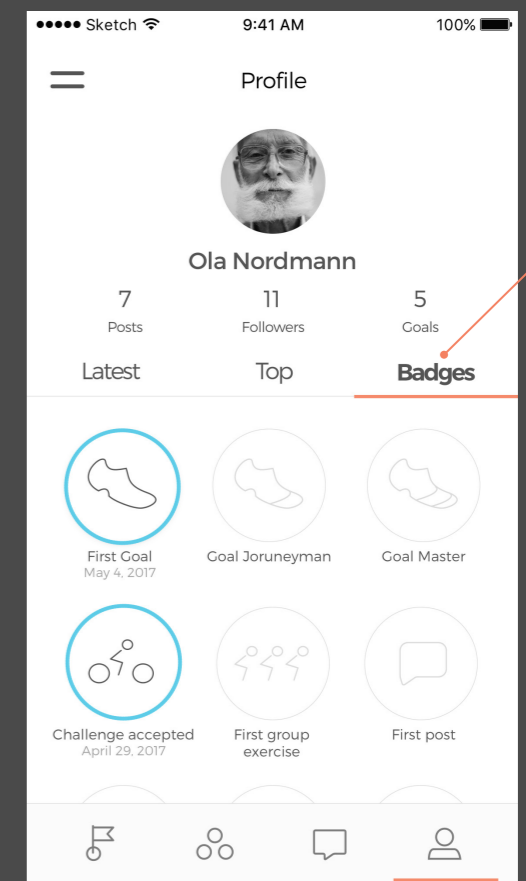
Unique challenges

Messages



Messages from others

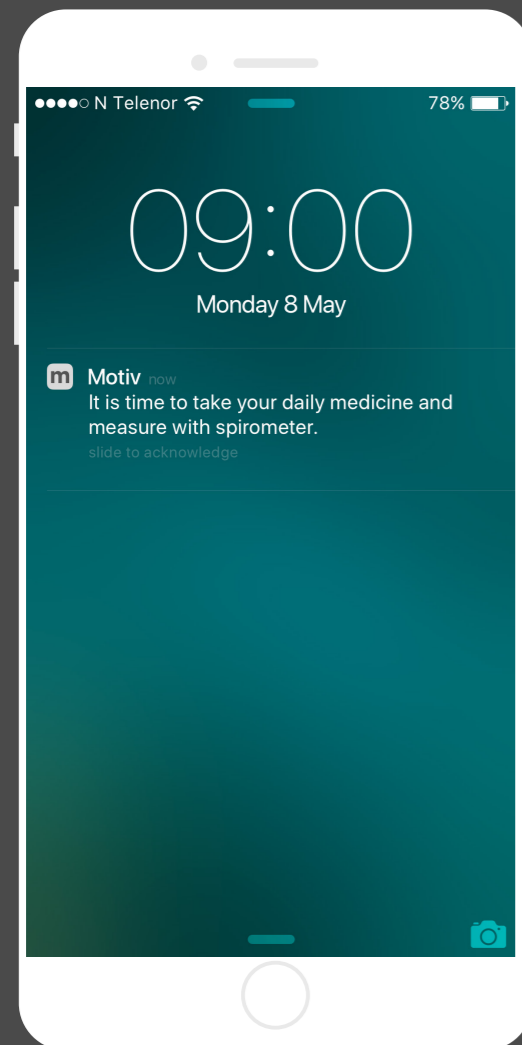
Profile



Social status

DAILY USE: CUE

Smartphones



Cue guidelines

In order to avoid annoying or stressing the user, the external cue should only be given once a day, at the time they desire. Ideally the user should link the cue with an existing habit they have, in order to develop a routine/internal cue.



Wearables

Multiple channels

Any form factor that is connected to the internet can in theory be used to give a cue, provided they can give feedback to the user.

Cue channels that can be used: SMS, phone call, app notification, computers, smart TVs, wearables, smart speakers, smart pill dispensers, etc.

For Motiv, I think it is important that the users can choose (during setup), what device(s) they would like to get reminders from.

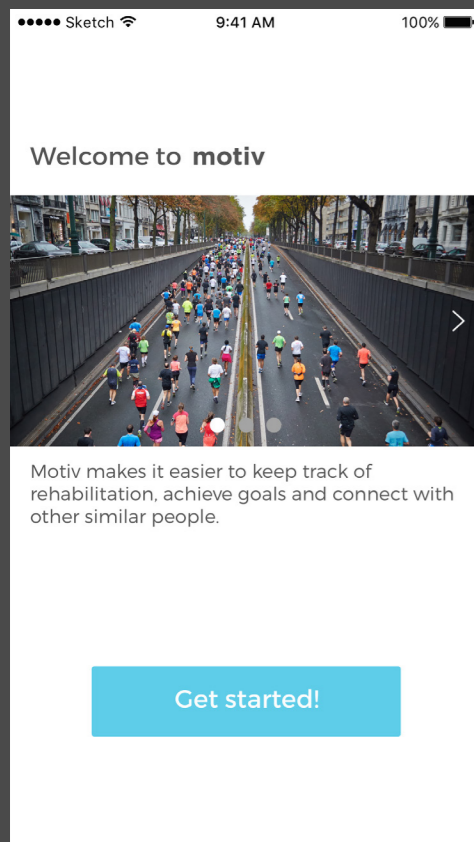
Smart speakers



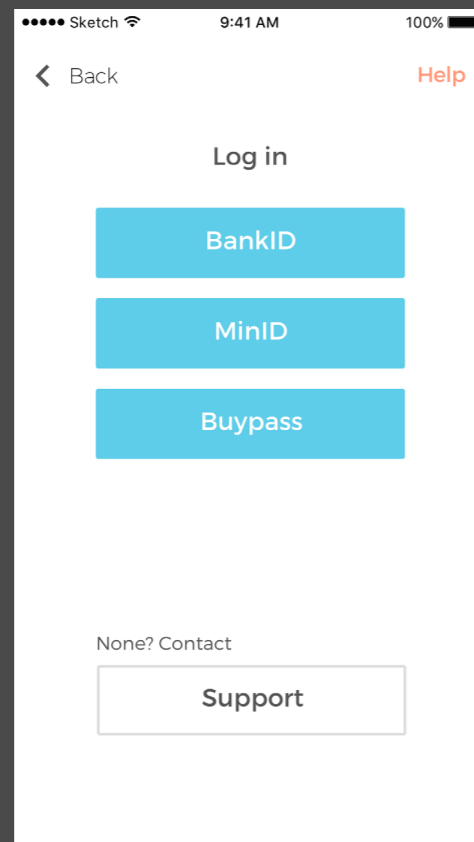
E-pill dispensers

ONBOARDING: SETUP

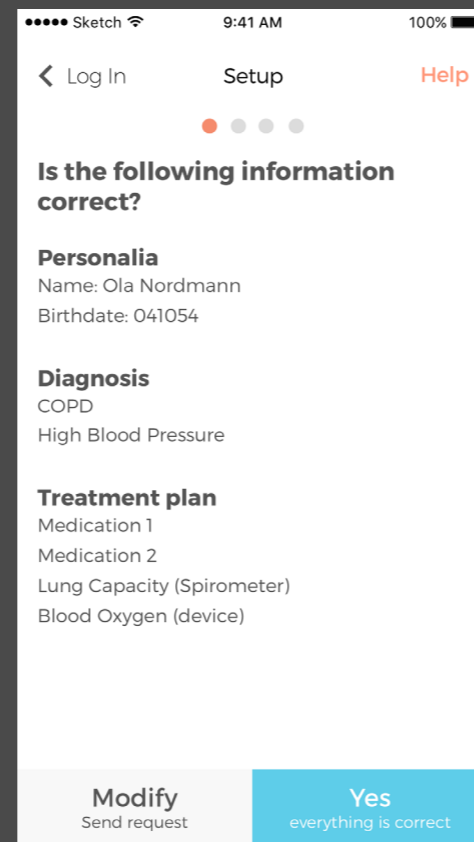
First time opening



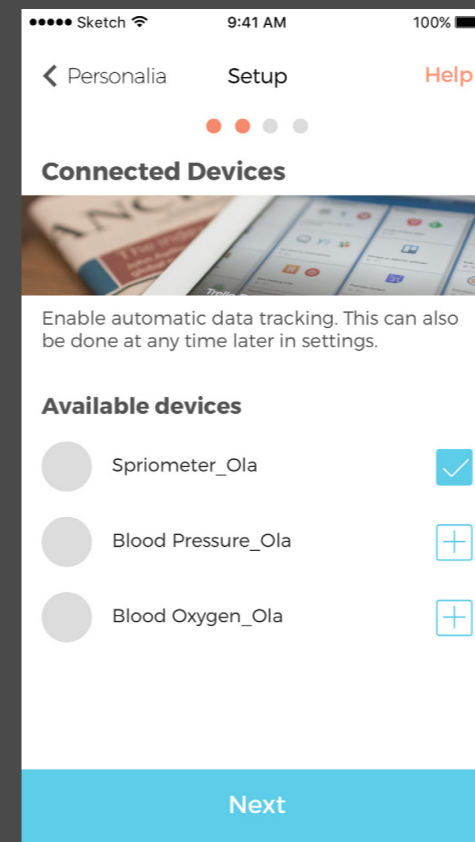
Logging in



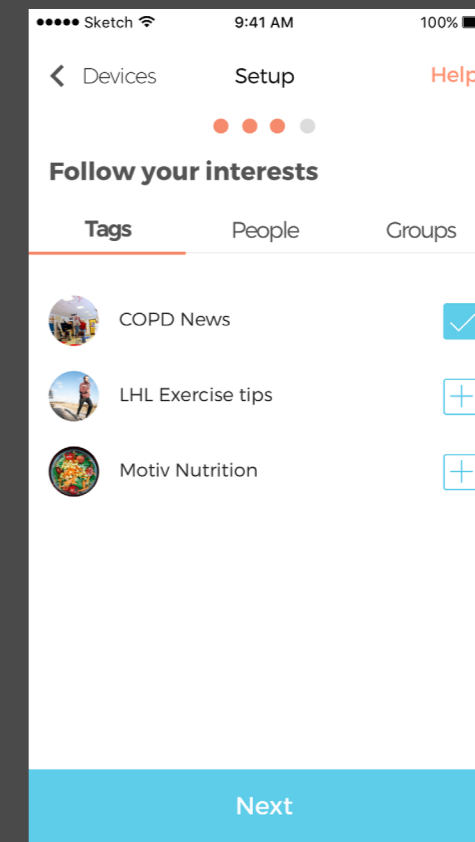
Personal info



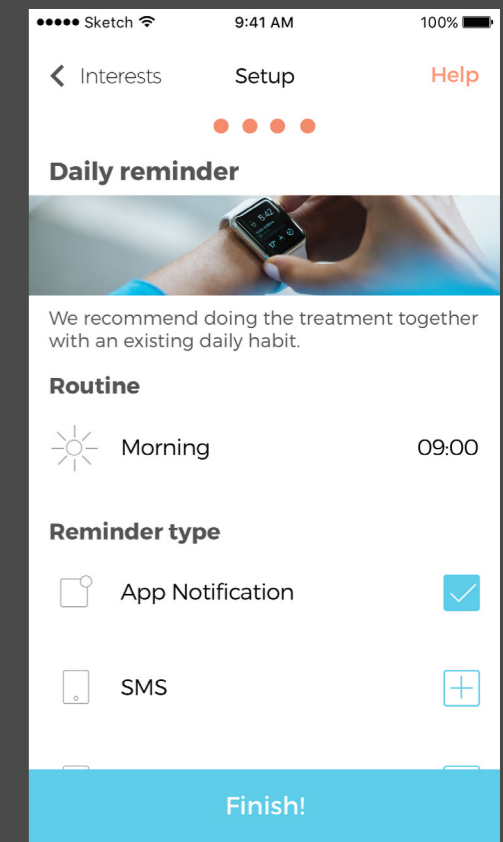
Devices



Customize feed

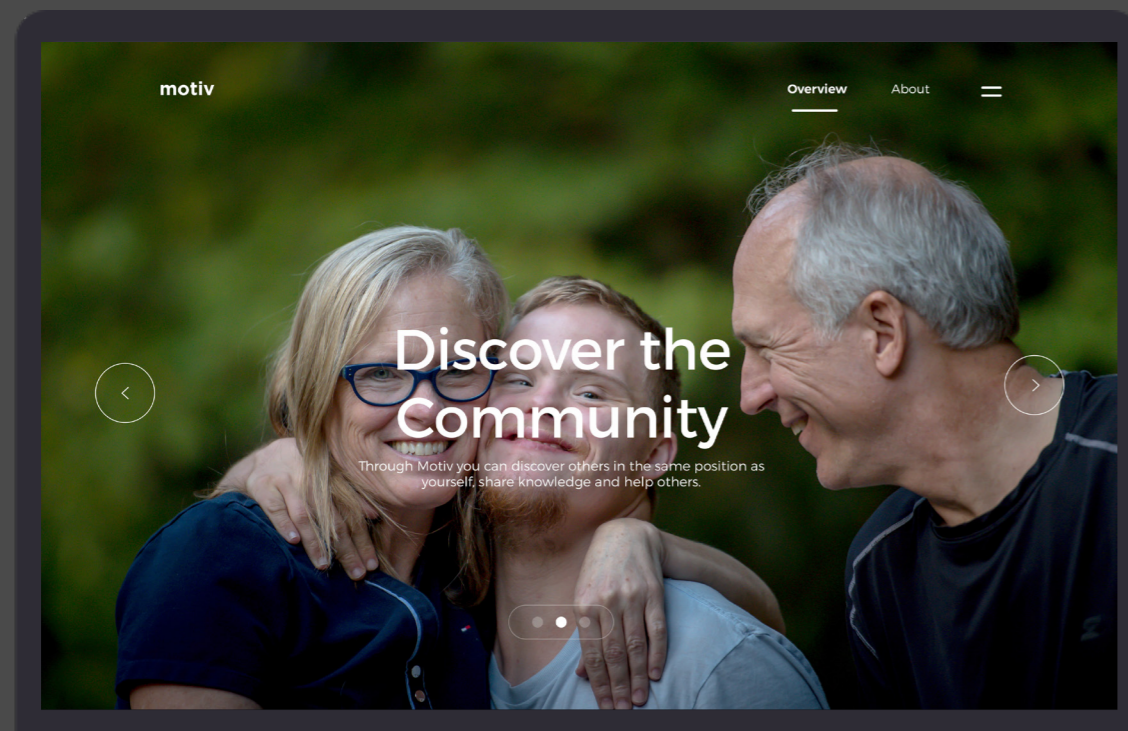


Cue time and channel



The last three steps can be customized and configured later through the app's settings.

ONBOARDING: OPPORTUNITY



For patient who would like time to think, read about and consider using the service, a website should be available for information and inspiration. This touchpoint also acts as another arena where the service could be discovered.

ONBOARDING: CAPABILITY

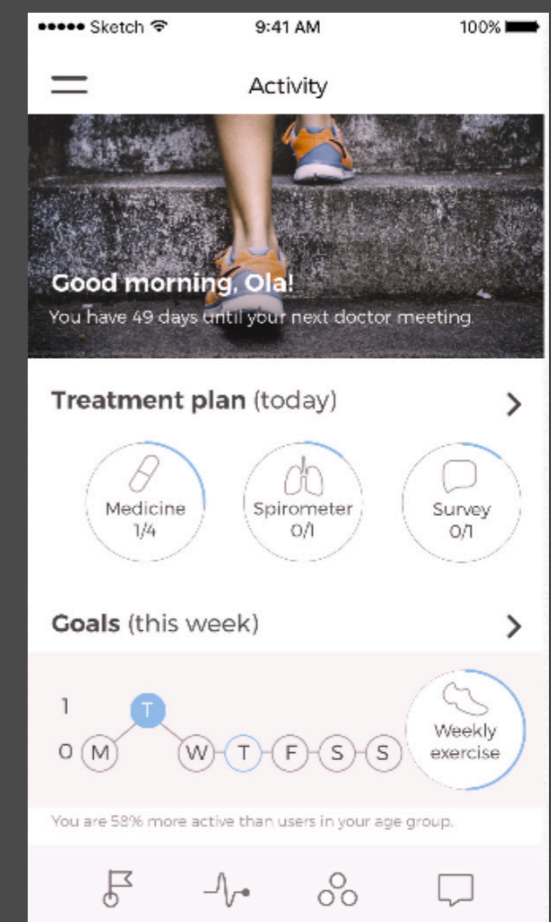
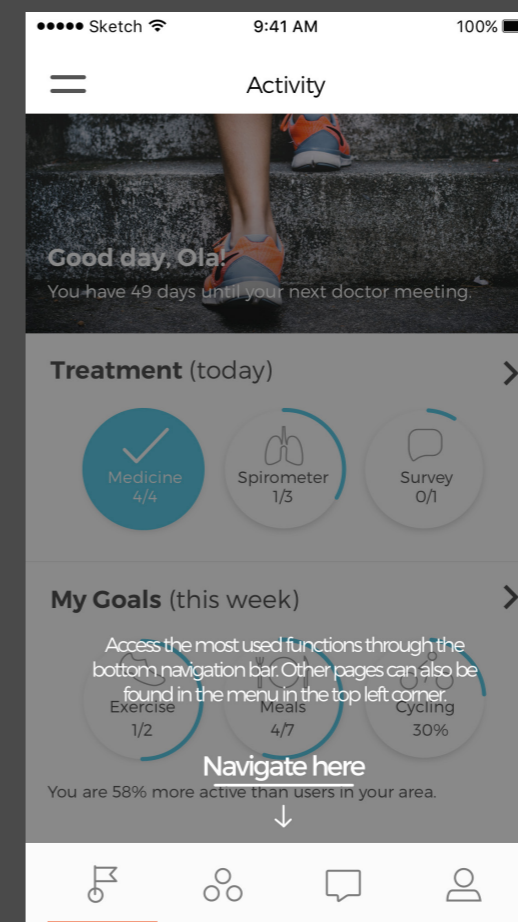
Accessibility

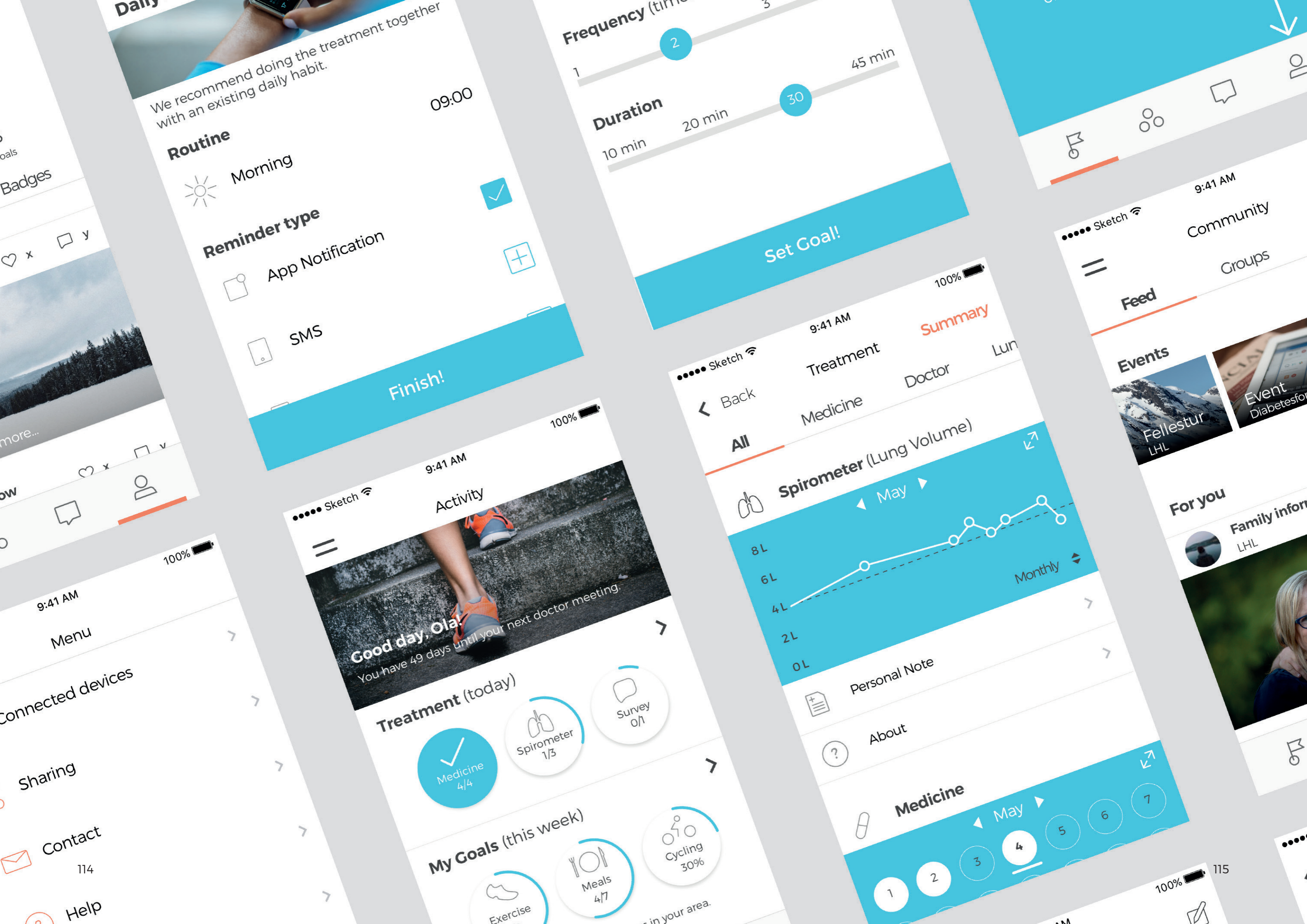
In order to make Motiv accessible for as many people as possible, the following features should be accounted for.

- Accessibility options in settings where readability (if the user has reduced vision) can be improved through text-size.
- Help/support
- Usability (good UX)
- Walkthrough/tutorial

Color-blind safe colors

All the screens have been tested for their readability with different visual impairments, such as protanomaly (red-weak), deuteranomaly (green-weak) or tritanomaly (blue-weak).





Daily

We recommend doing the treatment together with an existing daily habit.

Routine

Morning

Reminder type

App Notification

SMS

09:00

Finish!

Frequency (times)

1 2 3

Duration

10 min 20 min 30 45 min

Set Goal!

Sketch 9:41 AM 100%

Activity

Good day, Ola!
You have 49 days until your next doctor meeting.

Treatment (today)

Medicine 4/4

Spirometer 1/3

Survey 0/1

My Goals (this week)

Exercise

Meals 4/7

Cycling 30%

Sketch 9:41 AM 100%

Back

All Medicine Doctor Lun

Spirometer (Lung Volume)

8L 6L 4L 2L 0L

May

Monthly

Personal Note

About

Medicine

1 2 3 4 5 6 7

Sketch 9:41 AM

Community

Groups

Feed

Events

Fellestur LHL

Event Diabetesfor

For you

Family inform LHL

9:41 AM 100%

Menu

Connected devices

Sharing

Contact 114

Help

USE CONTEXTS

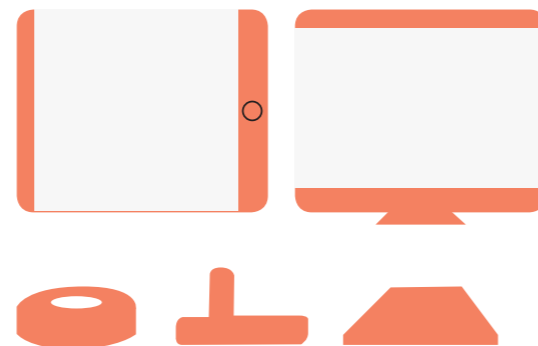
Home



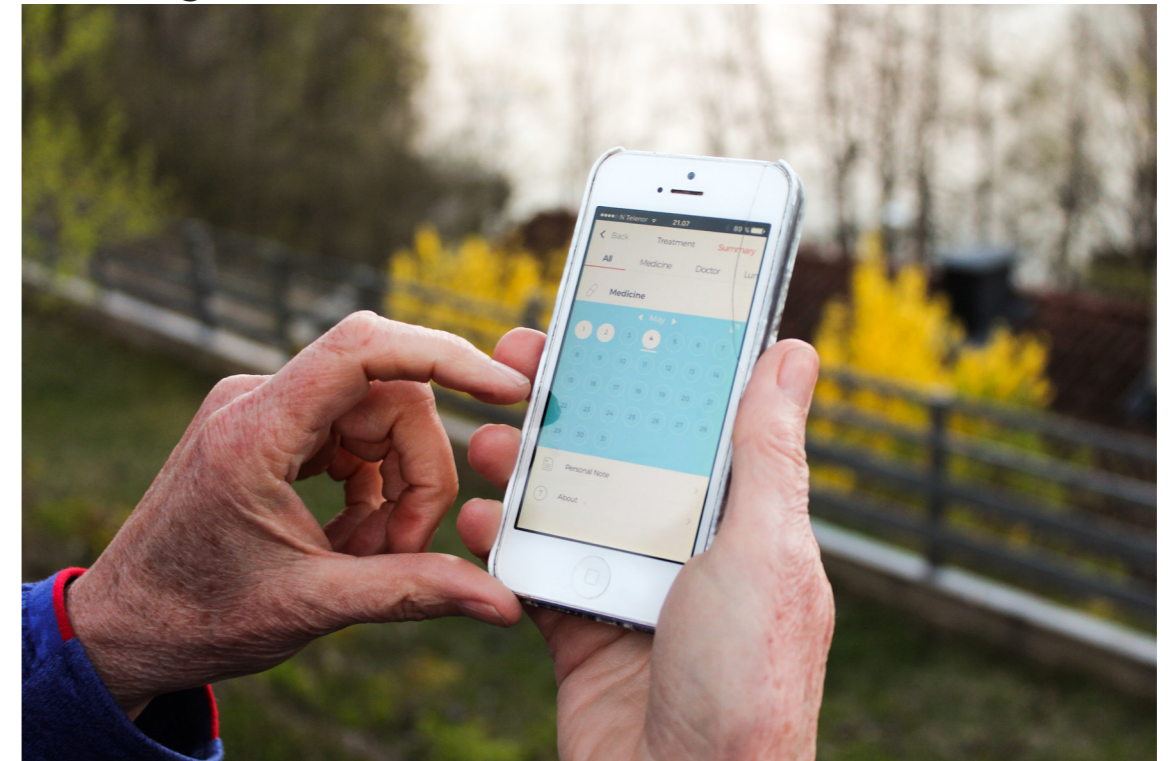
One of the primary use contexts of the application is the home of the user. This context is perhaps the most common, especially for the older user group.

In this context the users are more likely use larger displays (iPad/desktop) to interact, and different medical devices may be in their near vicinity.

Touchpoints:

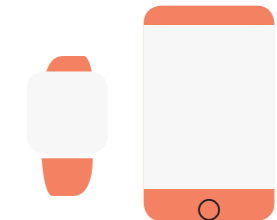


On the go



For a context where the user is traveling, outside their home or attending activities, mobile devices are more likely to be the platform of choice, being either smartphones or wearables.

Touchpoints:

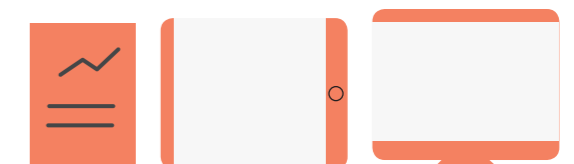


Clinic/Hospital

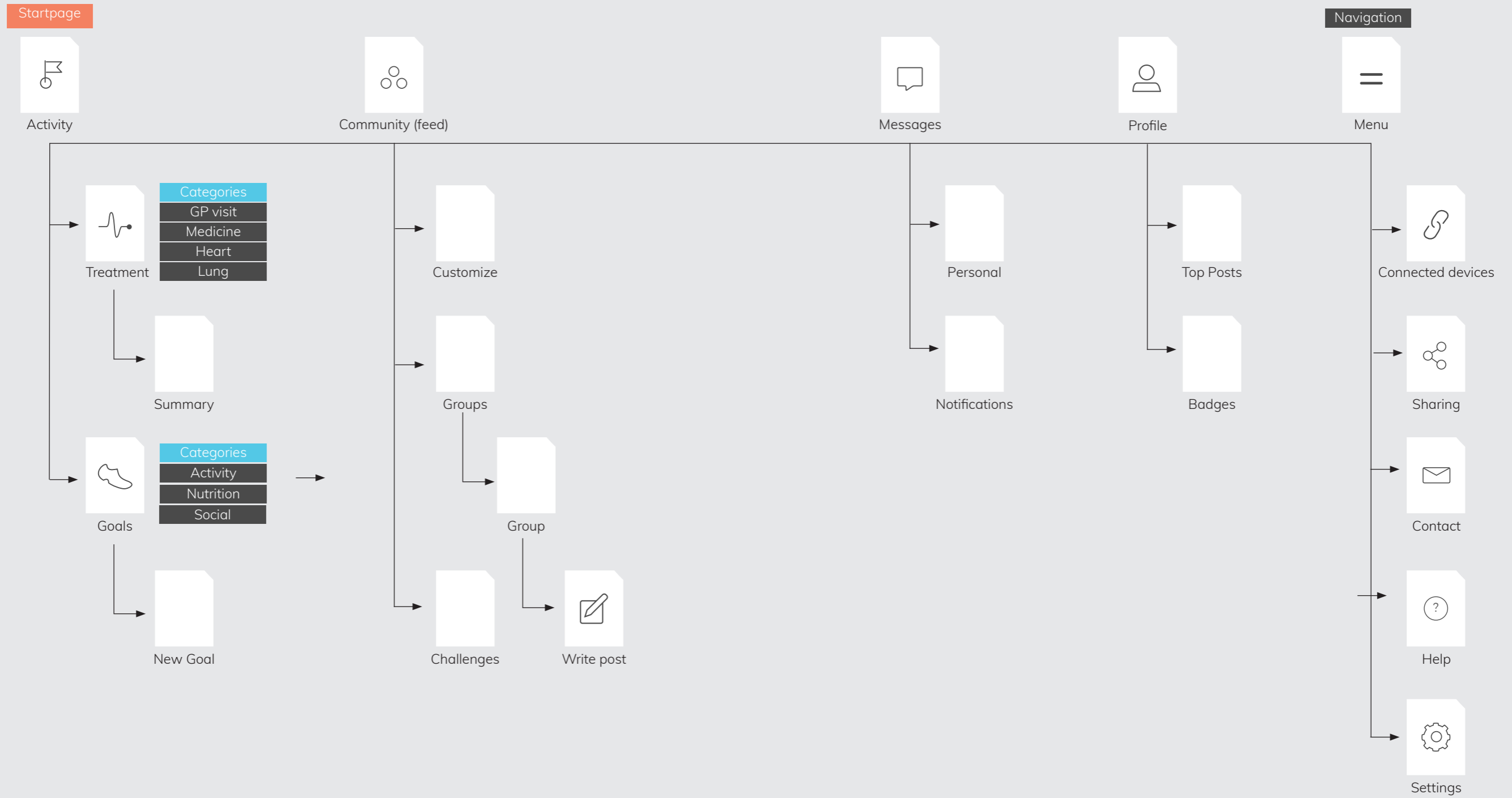


When the user/patient meets their doctor or health personnel at the end of each period. Based on the data on the progress collected during the everyday life of the patient, it is easier for the health personnel to re-evaluate the treatment plan.

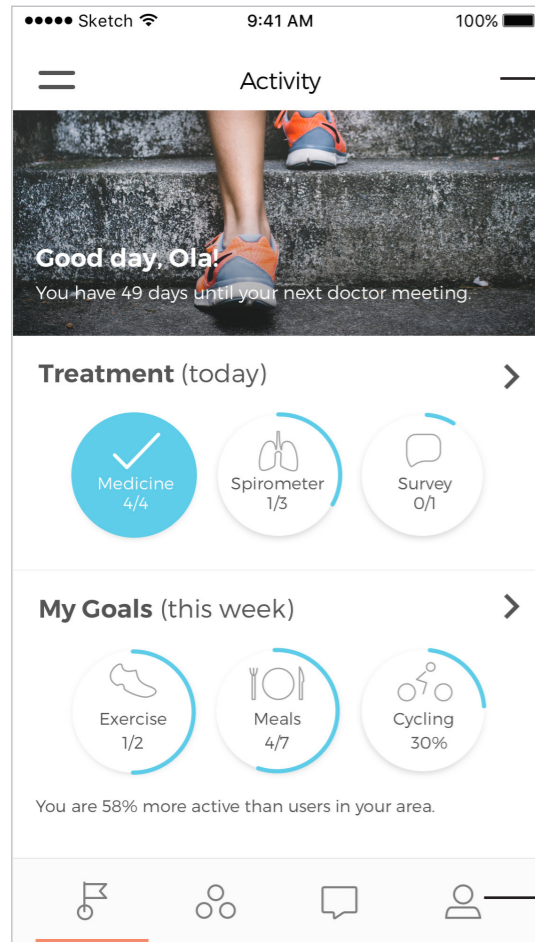
Touchpoints:



INFORMATION ARCHITECTURE



MOBILE NAVIGATION



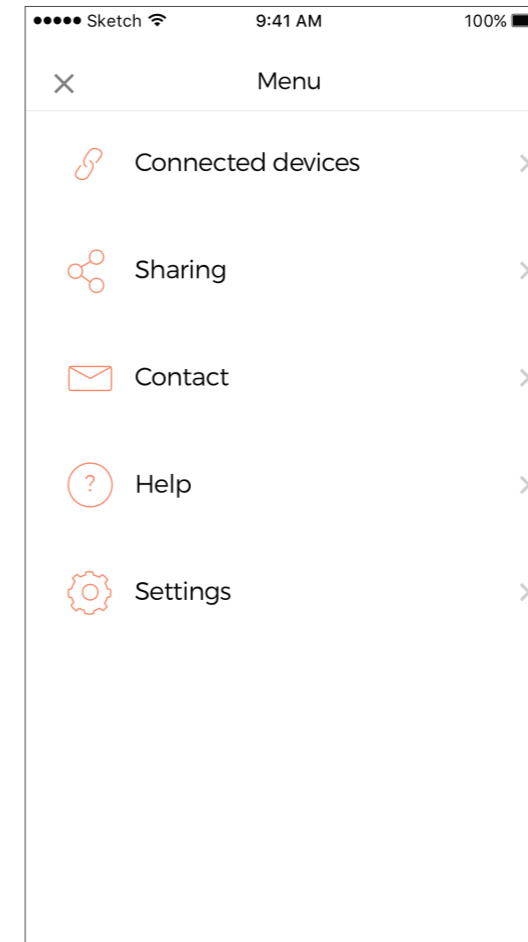
Top Bar

Being always visible the top bar continuously provides the name of the page, either a back or menu button on the left side, and, sometimes specific controls like search, on the right side.

Bottom Bar

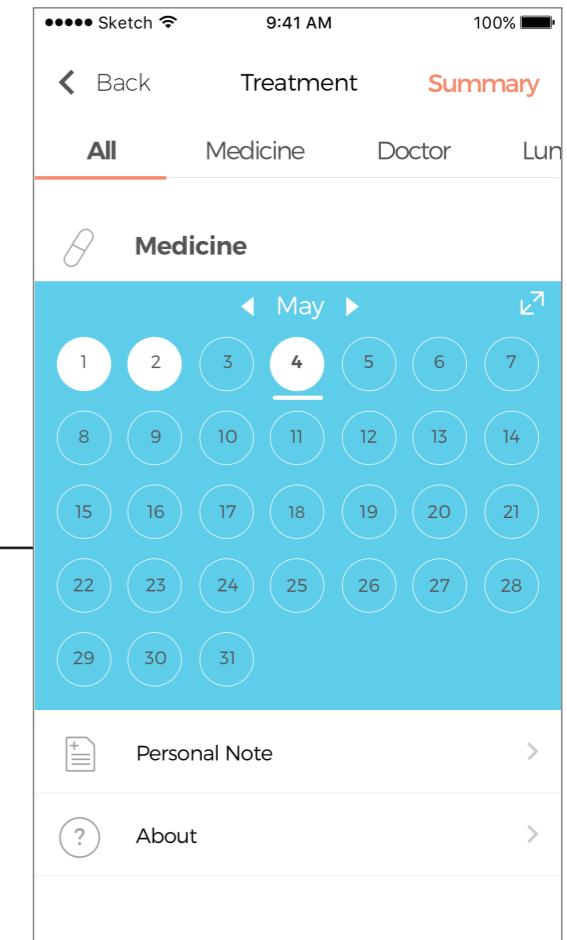
With phones increasing in size, having the most used pages easily accessible in a bottom bar provides good usability.

Recent research indicates that discoverability, glanceability and faster operation by showing the main navigation in a visible bar, instead of hiding the navigation in a menu (Pernice & Raluca, 2016.)



Menu

The menu contains all the other main pages that are not part of the bottom bar navigation.

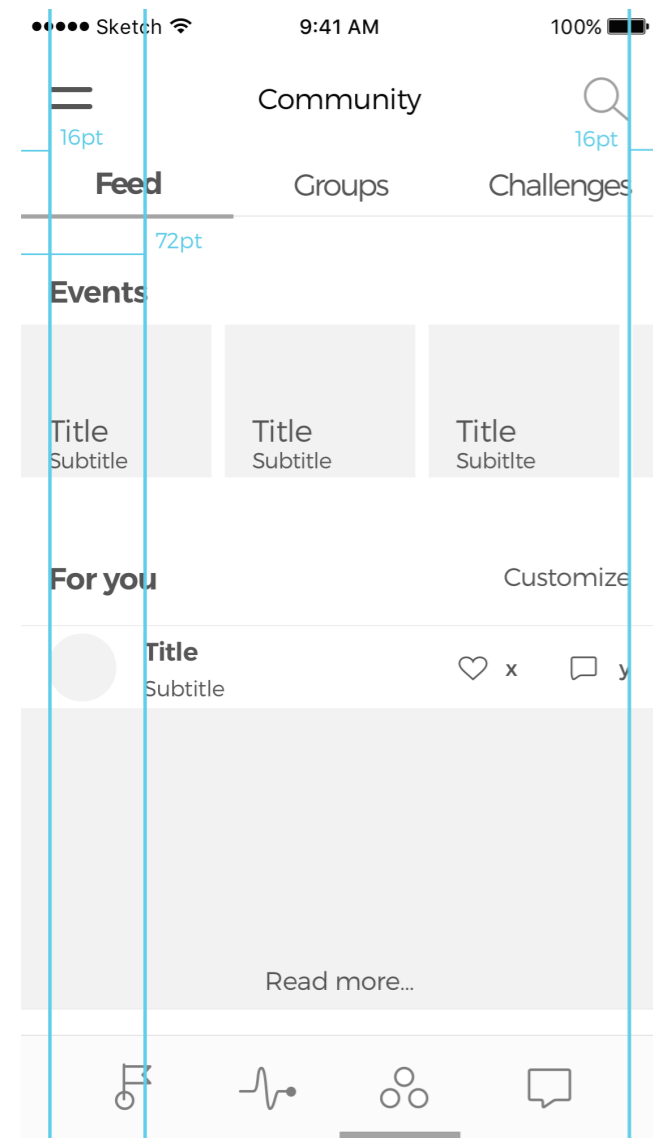


Detailed view

For certain expanded pages/views, the bottom bar will disappear, though navigation will still be present either through the top bar or buttons.

1. Pernice, K. & Raluca, B. (2016) *Hamburger Menus and Hidden Navigation Hurt UX Metrics*, Nielsen Norman Group. <<https://www.nngroup.com/articles/hamburger-menus/>>

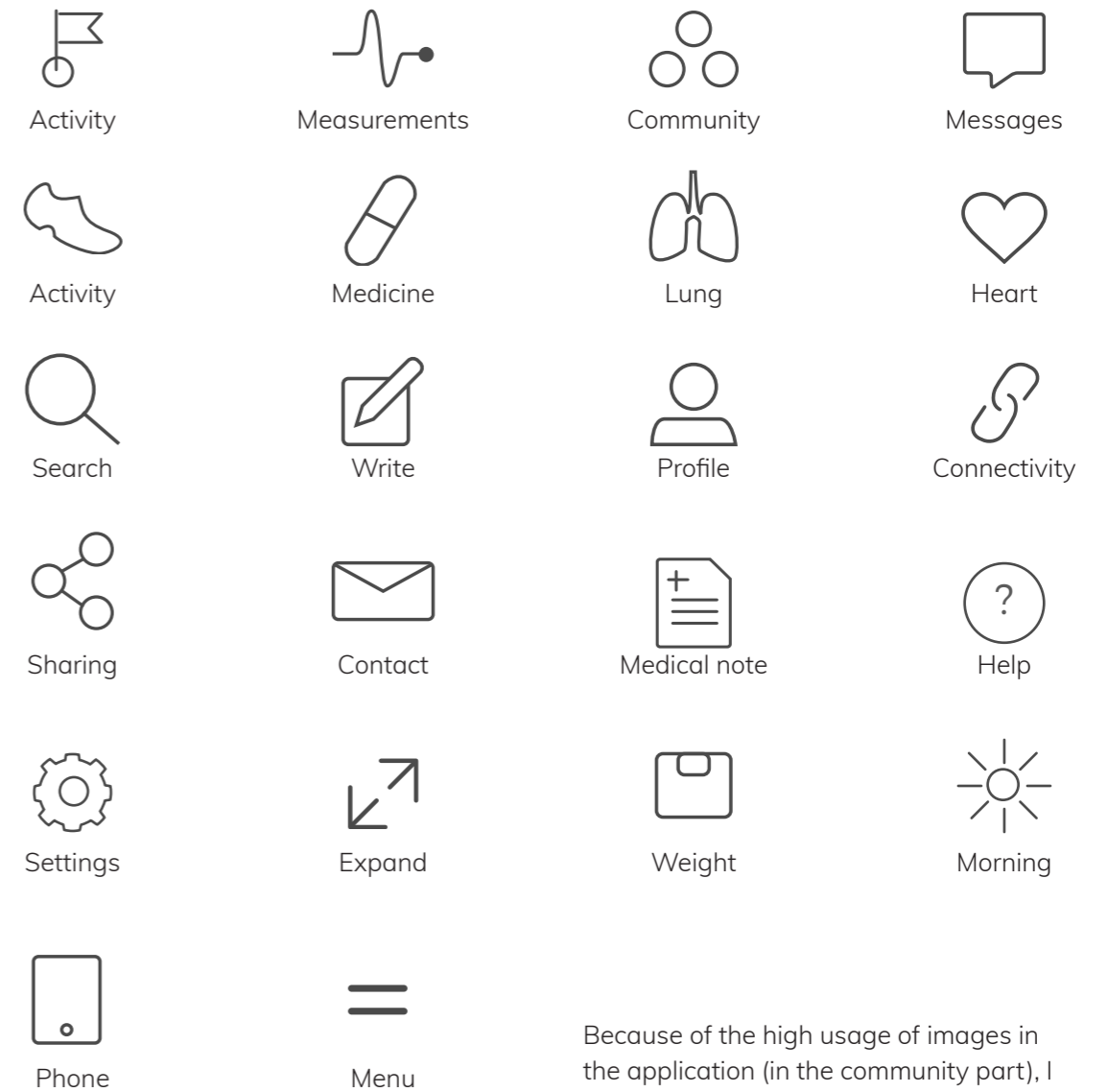
GRID



Margins, Sizes & Alignment

All of the pages are based on the same margin grid, with the exception of full-page elements like images or slider-bars. The different elements are sized according to different relations, for instance slider image width being 1/3.4 of the full screen width (for slightly "teasing" the next image), which can be programmed in a responsive solution for different screen sizes.

ICONOGRAPHY



Because of the high usage of images in the application (in the community part), I designed relatively simple and minimalistic icons to work well together with pictures.

VISUAL IDENTITY

One of the insights from the research was that many of the people I talked with wanted a solution that avoided a sickly, clinical and sterile expression, and instead provided them with a more fun and energetic experience.

Through showing the users different moodboards, it was possible to gain a direction in terms of a visual identity. I believe that the final solution offers a good balance of appearing safe + trustworthy and healthy + inspiring.

Title text: Montserrat semibold

**ABCDEFGHIJKLMN
OP
abcdefghijklm
nop**

Subtitle text: Montserrat light

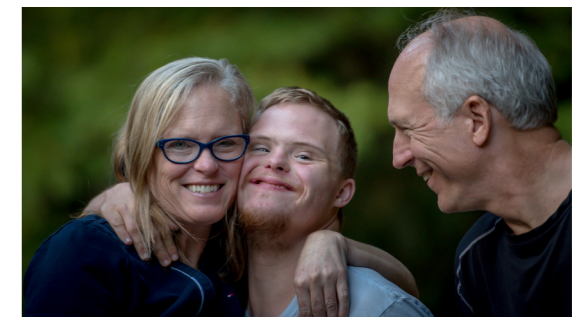
ABCDEFGHIJKLMN
OP
abcdefghijklm
nop

Body text: Muli, Light/italic

ABCDEFGHIJKLMN
OP
abcdefghijklm
nop

R: 255 G: 255 B: 255	R: 247 G: 247 B: 247	R: 75 G: 75 B: 75	R: 255 G: 140 B: 110	R: 100 G: 190 B: 230
----------------------------	----------------------------	-------------------------	----------------------------	----------------------------

Image guidelines



Images of "normal" people, doing inspiring things, in natural settings is advisable.

"We like healthy, energetic and natural images that inspire calm and happiness. It is important not to be stressed."
Females, COPD



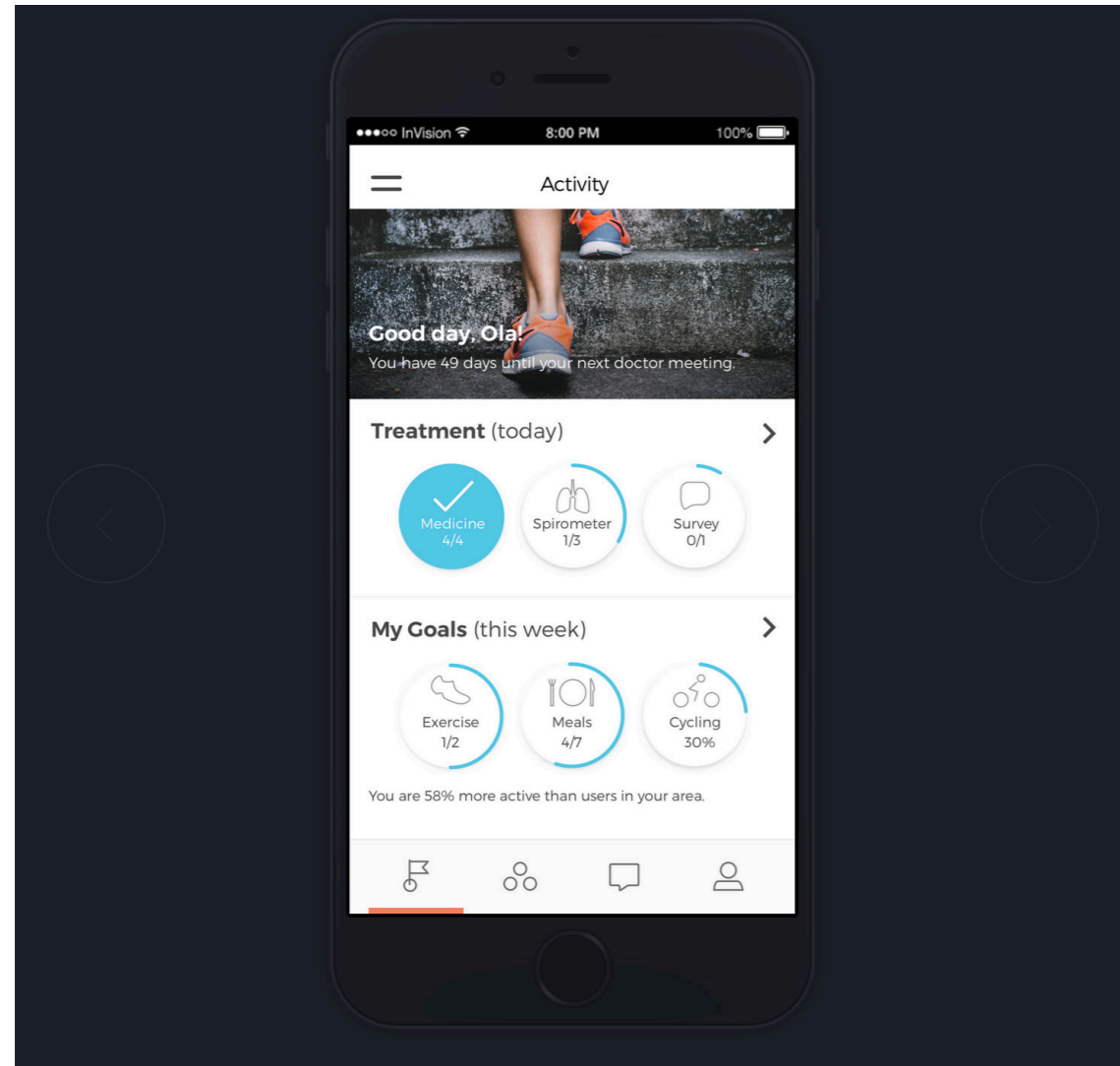
Images of specialized activities that show a high skill degree/ or require extensive equipment will likely only affect a small portion of the user group.



Images of unnormally fit/muscular athletes/ bodybuilders should be avoided as they are not relatable for the user group.

"These kinds of images wont inspire people who have had a stroke, since they embody an unachievable ideal you will never become."
Male, cardiovascular disease

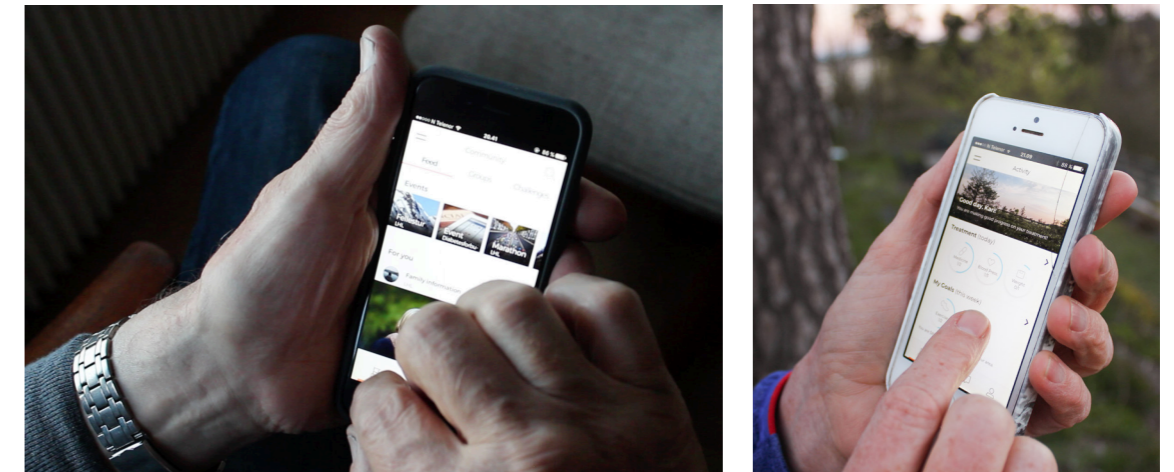
PROTOTYPE



Try me!

<https://invis.io/FDBJAJ867>

FEEDBACK: FINAL ITERATION



Usability

During the last usability test, I was silent and filmed new users trying to use the prototype. Since the test was recorded I could analyse their interactions with the prototype afterwards.

At first the users were a little unsure how they navigated in the application (the prototype did not include a walkthrough and I did not give any instructions), but after around 10-25 seconds they had figured out the main navigational elements. The users needed to see the feedback based on their input, in order to learn the interaction methods (and connect anticipation with result). This indicates that the final iteration has a relatively high level of discoverability.

It took a little longer for them to understand what the different content was. I believe this would have been more clear if they knew more aspects of the service beforehand, which would be the case in a realistic scenario. They did like how the content was represented.

Identity

“The app has a medical expression, because of the blue, with sober fonts and straight lines. (...) I think it looks clear and obvious.”

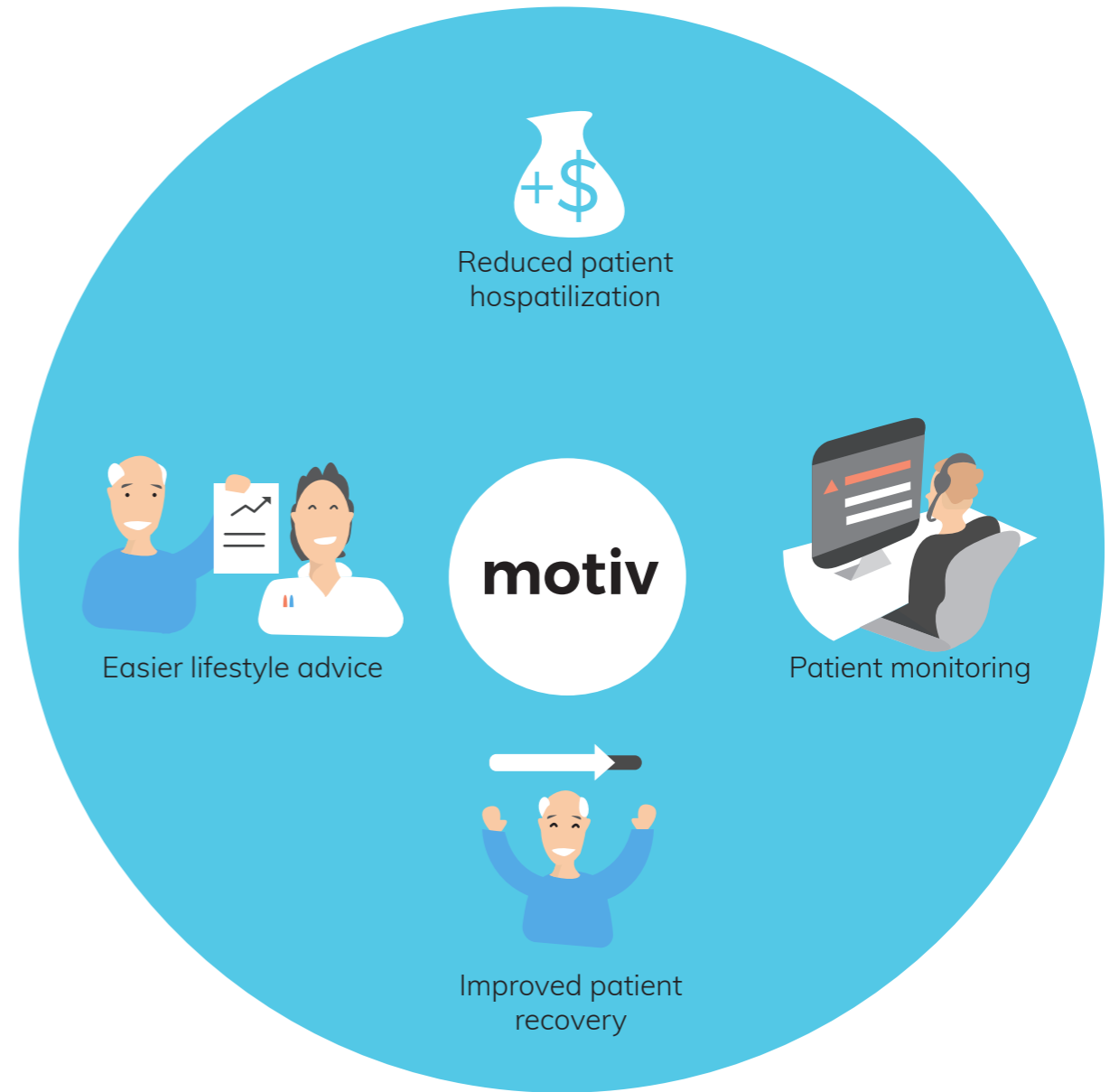
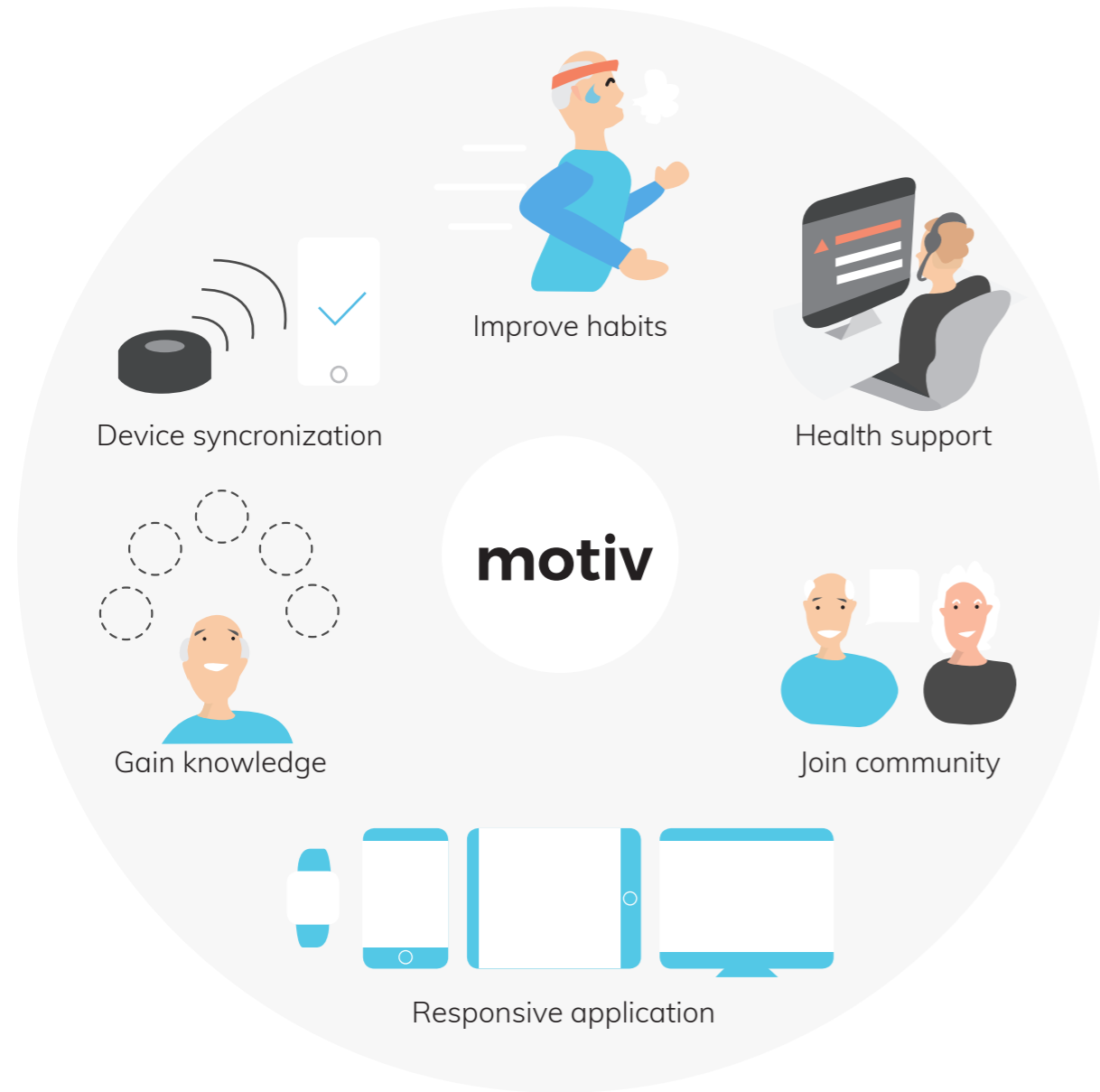
Male, Cardiovascular disease.

The users thought the application looked medical, but also fresh and inspiring. This is fairly close to the intended brand identity.

Summary

Based on the testing through the project, and of the final iteration, the application seems to have a high degree of usability, and promotes the correct identity. However, I definitely wish I had more time for usability testing, to go through a few iterations more, and to finish designing the application for the tablet/desktop format.

As mentioned in the “concept development” chapter, I also would have liked to test more on the engagement mechanisms for long-term usage. Nevertheless, considering the breadth of this project, from research to behavior theory to design, I am satisfied with the level of the design delivery.



6. REFLECTIONS

“As long as you learnt something...”

Content

Contribution

The Attention Economy

Acknowledgements

References

CONTRIBUTION

Delivery

The main contributions of the diploma:

- A home-service for rehabilitation and treatment.
- A digital application that uses behavior mechanisms to solve problems in this context.
- A new model for behavior change, with a canvas for ideation.
- Insights in the report from research and mapping, on context, users and behavior theory.

Impact

If the project was to be implemented or if stakeholders are inspired by the diploma, it might contribute in the following areas:

Reduced costs in the healthcare sector:

- Better patient rehabilitation and recovery
- Less hospitalization

Improved patient/user life quality:

- More support in rehabilitation.
- Better feedback on progress.
- Health improvement/reduced health decline.
- Better information from patient health organizations
- Less time spent on traveling to hospital.
- Greater feeling of relatedness with other similar patients.

Stakeholders

I have met and presented for Dignio AS several times during the project, and they are very interested in the behavioral aspects of the project. In addition, the service and digital application may be used for inspiration, as Motiv is more focused on empowering the user, and they currently lack a smartphone interface.

Another similar company is Imatis AS, though it is a competitor to Dignio, might also have interest in the project.

Other relevant stakeholders include: LHL – The Norwegian Heart and Lung Patient Organization, The Norwegian Directorate of eHealth, Teknologirådet, Sunnaas Hospital, Lovisenberg Hospital, AHO, UiO, NTNU, Oslo Medtech.

“We are very interested in the motivation mechanics in this project.”

Lars Dahle, CEO Dignio AS

“We don’t believe in a fully automated service, but it would be useful to discover which functions could be automated.”

Lars Dahle, CEO Dignio AS



Fig. 45.: Presentation, testing & feedback at Dignio AS with CEO, CTO, developers and product manager.

Methodical contribution

The Unified Behavioral Model			
<p>Cue Internal or external calls to action that trigger the behavior.</p> <p>Internal Mood, cognitions, affect, neurophysiological state.</p> <p>External Sight, sound, smell, touch, taste, proprioception, vestibular, thermal, pain, pressure, light, temperature, humidity, air quality, etc.</p>	<p>Capability Intrinsic or extrinsic psychological or physical ability.</p> <p>Intrinsic Digital operation skills, Communication skills, Reasoning skills, Motivation, Self-regulation, Learning ability, Attentional ability, Cognitive ability.</p> <p>Motivation Desires or willingness of the person to do the behavior, and an effort to control it.</p> <p>Intrinsic Autonomy, Social norms, Shyness, Sensitivity, Personal goal, Status, Social acceptance/Rejection, etc.</p> <p>Extrinsic Beliefs, Perceived control, Effort-reward ratio, Anxiety/joy/pleasure, Attraction, Cognitive program, Incentive, Self-pressure, etc.</p> <p>Opportunity Situational opportunities, Action: selection of the person's control.</p> <p>Intrinsic Availability, Attentional strength, Self-regulation capability, Motivation, etc.</p> <p>Extrinsic Weather, Time, Transportation, Social norms, etc.</p>	<p>Behavior The way in which a person acts/ performs. Behavior is action for results.</p> <p>Control of habit learning Control of habit learning depends on the quality of a behavior's reward/punishment and the salience of the cue.</p> <p>Behavioral activation To change a habit, keep the same cue and avoid habit strength reinforcement.</p> <p>Behavioral inhibition Difficult to perform behavior → Requires high motivation → Easy to perform behavior → Easy to inhibit behavior.</p>	<p>Reinforcement Positive or negative strengthening of a pattern of behavior.</p> <p>Positive Reward, Reinforcement, Program, Operant goal, Pleasure, Status, Power, etc.</p> <p>Negative Punishment, Displeasure, Pain, Anxiety, Stress, etc.</p> <p>Consequences Results of the habit/behavior, Results of the Self-Regulation, Results of the Self-Organization, etc.</p>

The UBM model should be tested more, and be further validated or refined, but it could be applied to other digital services in the healthcare sector.

It could also be used for digital services working with behavior change in other sectors, which would make it a useful tool for other designers.

Personal outcome

Looking back at this project I am satisfied overall with my diploma. I have worked hard, learned much about behavior psychology and welfare technology.

I am sure this knowledge will be useful in my further practice as a designer.

I am also happy if my diploma can provide inspiration for relevant stakeholders, which seems to be the case.

THE ATTENTION ECONOMY

During this project I have gained increased awareness of how the most prevalent digital services today use engagement mechanisms.

Today, almost everything competes for our attention, because business interests rely on maximizing engagement.

- Apple, Google, Facebook, Snapchat and Amazon rely on attention to sell advertising and user data.
- Politicians need attention to get elected.
- Newspapers and news channels need views and sensational articles to live off advertising.
- Entertainment channels like Netflix, Youtube, Hollywood and video games, optimize for hype and time.
- Friends and acquaintances on social media compete in the social hierarchy for social validation.

Historically, the economy was largely based on the exchange of physical goods and services. There is evidence that trade and banter may be older than 50 000 years, and therefore precedes civilization itself. Although the complexity of the quantity of the goods increased rapidly, this basic exchange-model stayed more or less the same for many millennia.

Beginning perhaps with the news, entertainment and advertising industries, a new business model arose. Some products and services started being offered for free, but with an alternative cost instead being people's attention and time.

With the mainstream adoption of digital services, in the late 1990s, this new

attention-based business model became almost the de-facto practice. One of the factors that enabled this model was the low to none production- and distribution cost.

The introduction of smartphones made it possible for people to always be online, accessible and attentive. Smartphone habits for people in the US in 2016 are the following: 40 % check their phones within 5 minutes of waking up, people on average check their phone 47 times a day (82 for 18-24 year olds), 30 % check their phones within five minutes of going to sleep and 50 % check their phones in the middle of the night (Deloitte, 2016).

Learning how to use psychological mechanisms to maximize user engagement, is in some companies considered an important part of delivering value as a digital designer.

This single pursuit of profit-oriented goals of increasing user conversion rate, reducing churn/user turnover, sometimes result in designs that start exploiting the user and disrupting their lives. This kind of manipulation is often referred to as "dark UX patterns" (Brignull, 2017), and is pretty much the antithesis of usability and a good user experience.

There are definitely areas and contexts where increasing engagement and shaping behavior and habits, can be positive for the user. The health and fitness industry are areas where engagement can cause improvement in a person's life. Nonetheless, in all contexts we need reflect and design according to the attention impact for the user.

The problem is that as human beings our attention and energy is not limitless. Unlike technology we cannot grow exponentially, or add any hours to the day. We need to conserve, recharge and focus our attention on the things that matter in life.

If we are unable to focus on our dreams, goals and aspirations that we care about, or develop meaningful relationships, how can we live a fulfilling life?

If people are too occupied to delve into complex topics, how can we as a society solve the great challenges we face in regards to our environment, poverty and sustaining/improving democracy?

There is no professional oath that all designers must swear to in order to perform practice, but I believe most designers would agree that our role is to be the user's first and foremost champion. The challenge is that we also have to balance the needs of companies, society (if politically oriented) and the end users.

Good intentions and ethics are fine on paper, but what can actually be done in practice to achieve this balance? This is a complex topic, with many possible answers, but I believe the following is important.

Mechanism + everyday life considered
We are bombarded with external cues (notifications) from services today, for pretty much any minor or petty reason. This results in many users simply turning off all notifications, in the platform settings. Would it not be better if there was a notification-hierarchy, and the user was only informed of important messages, at times of the day convenient in their life?

Redefining success
What if digital services, instead of using engagement metrics like views, users, likes, scroll-time, etc, measured success in people's actual ability to accomplish personal goals? The impact on the design could mean that the service would focus on more adding value to the user's life, instead of just craving time.

Looking ahead
Services that abuse manipulative mechanisms and dark UX practices may find it to be unwise in the long-term as they lose brand reputation. As consumers and designers become more digitally mature, jaded by annoying services and more aware as problems arise to the surface, we should and must demand better everyday synergy with our products.

1. Doksanalti, E. & Aslan, E. (2008) Trade and Production through the ages, Konya. <https://www.academia.edu/2267558/Trade_and_Exchange_in_Prehistory._A_Theoretical_Evaluation>

2. Deloitte (2016) 2016 global mobile consumer survey: US edition. <<https://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/articles/global-mobile-consumer-survey-us-edition.html>>

2. Brignull, H. (2017) Dark Patterns. <<https://darkpatterns.org/>>

ACKNOWLEDGEMENTS

I would like to thank those who made this project possible:

LHL for getting me in contact with patients as well as health personnel. Special thanks to **Rita Hartfjord** and the heart and lung trim group for letting me test and get feedback.

Jan Egil Nordvik for giving me feedback on behavioral mechanisms and models from psychology.

Natalia Alvarez for providing useful tips on mapping.

Kaja Misvær Kistorp for letting me learn more about VIS.

Lars Dahle, CEO, Dignio AS for taking the time to provide feedback several times during the semester.

Einar Sneve Martinussen for useful thoughts on health in everyday life.

To **Rasmus** and **Ragnild** for monday standups.

Vilde Strøm for proof-reading my text.

Last, but not least my main supervisor **Kjetil Nordby** for mentoring the project almost each week and providing great guidance and insights.

Thanks for reading this diploma:)

REFERENCES

All references and sources are provided in the text/on page.

All images in the report and design either:

A) I own the rights myself.

B) Source is provided in text.

C) They are royalty- and attribution free from either Unsplash (<https://unsplash.com/>) or Pixabay (<https://pixabay.com/>).

