

Digitalization Within Health Care

Development of Digi-Physical Concept for the Welfare Officer Care Services at Skaraborgs Sjukhus Master's Thesis in Product Development

Christoffer Sandahl

DEPARTMENT OF INDUSTRIAL AND MATERIALS SCIENCE

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Department of Industrial and Material Science *Product Development* Chalmers University of Technology Gothenburg, Sweden 2021 Digitalization Within Health Care Development of Digi-Physical Concept for the Welfare Officer Care Services at SkaS CHRISTOFFER SANDAHL

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Internal supervisor: Maria Daniela Irene Siiskonen, Chalmers University of Technology

Internal Examiner: Johan Malmqvist, Chalmers University of Technology

External Supervisor: Svante Lifvengren and Emma Bodemyr Ekblom, Skaraborgs Sjukhus

Master's Thesis 2021 Department of Industrial and Materials Science Product Development Chalmers University of Technology SE-412 96 Göteborg Telephone +46 31 772 1000

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CHRISTOFFER SANDAHL

Department of Industrial and Materials Science Chalmers University of Technology

Abstract

The master's thesis was carried out in a collaboration between Chalmers University of Technology and Skaraborgs Sjukhus. The purpose of the thesis was to help Skaraborgs Sjukhus develop their existing services for patients that are or will be subscribed to welfare officer care to meet a growing need. The thesis was mainly focused on digitalization of the welfare officer care and is heavily based on a stakeholder's needs collection.

For the master's thesis, the DMADCL-method has been used. DMADCL is an acronym for Define, Measure, Analyze, Design, Control, Learn, and was chosen since the project group assigned at Skaraborgs SkaS was familiar with it from previous work done in their domain.

The main results from the master's thesis are an extensive *Stakeholder's needs list* with needs for future services at the welfare officer care department at Skaraborgs Sjukhus, a *Function Diagram* of a digi-physical service pack process from a patients point of view, an action plan to implement the digi-physical service pack process and a visual conceptual prototype of a phone application for the welfare officer care department's patients based on the *Stakeholder's needs list*.

Concluding remarks are that from the deliveries of this master's thesis the hope is that Skaraborgs Sjukhus can leap forward in their work for a digi-physical future where the availability of the welfare officer care supply meets the demand to a satisfying degree. Furthermore, is the hope that the extensive stakeholder's needs research, that would have been a time consuming project for Skaraborgs Sjukhus without external help, can benefit future projects within Skaraborgs Sjukhus and other welfare officer care institutions in Sweden and globally when facing the growing societal demand of named care.

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1. Introduction

In the introduction chapter the project's background, problem description, aims, purpose, research questions, limitations, and deliverables will be presented.

1.1 Skaraborgs Sjukhus – Hospital Group

Skaraborgs Sjukhus (SkaS) is a group of hospitals in the geographical region Skaraborg. The group contains the hospitals of Falköping, Lidköping, Mariestad, and Skövde which is governed by the political instance of Västra Götaland. SkaS is an emergency hospital, which according to a proposition from the Swedish government, the department of social affairs, is a hospital that should be ready for and have resources for acute healthcare-related issues every day and night, all days per year (Socialdepartementet, 2005).

Today, SkaS has room for 512 patients, mediates around 4500 employees, and is active in a population area with roughly 260,000 individuals (Västra-Götalandsregionen, 2020).

1.2 Background

This master's thesis is addressing the welfare officer care services at SkaS. By looking at the definition from Västra Götalandsregionen, welfare officer care entails psychosocial work that aims to support individuals with psychosocial problems. Welfare officers are most often found within the traditional health care, hospitals that are, or within the circle of education, mainly schools (Västra-Götalandsregionen, 1177, 2021).

As described in the report *Effektiv Vård* by Statens Offentliga Utredningar (SOU, in English: *Effective Care* by The Government's Public Investigations), the demographical development of Sweden's population is that the population pyramid, that displays the number of individuals of different age spans, will be turning more into a tower in the future, that means the number of individuals in each span is evening out (SOU, 2016). The reason it is evening out is that the number of older individuals is growing larger at the same time as the number of children per woman is decreasing. What this means for the health care in Sweden and hence SkaS, is that number of individuals diagnosed with a chronic disease and thereby also gets in the pool of potential patients for the welfare officer care is increasing. The demand for more welfare officer care increases at a faster rate than the resources gained to the welfare officer care, which means that more focus needs to be put on effective and efficient procedures and methods. The hope is that by making the welfare officer care more effective and efficient, the supply of it can be equal to, or larger than the demand.

The master thesis focuses on digi-physical solutions where the term *digi-physical* means the combination of digital and physical care services. In this project it will refer to a combination of digital as well as physical solutions combined to one concept for the welfare officer care services at SkaS that will fulfill the needs described by the stakeholders. The idea behind digi-physical services is to be able to take advantage of both the digitally positives, like cost and time efficiency, and the physical positives, like communication clarity and relation building. Furthermore, the digi-physical solution track is thought to be able to reduce waiting times by sorting out patients with no need of Welfare officer care services without having any physical meetings, which often takes more time than a digital meeting (Peber & Wästfelt, 2020). Shortly described, the digi-physical path seems to be of great significance in the welfare officer care to keep up with the increasing demand.

Through personal communication with welfare officer Margaretha Lundin at SkaS, the largest relevance of this project will be to help SkaS in the direction of increasing the availability of the welfare officer care by developing a broader and faster way into the first contact with the welfare officer care since the current way is too narrow. It will also be relevant in the aspect of clearing out the role of a welfare officer to both patients and other professions at SkaS so that the welfare officers can put more effort into their area of expertise (Lundin, 2020).

Lundin also talks about the great potential that she has experienced when it comes to self-care, the care tools, and treatments that patients can do themselves. Today very many patients can do a lot themselves for their mental wellbeing. Thereby she opens for a whole new niche for self-care tools provided and distributed by not only SkaS but ideally nationally in Sweden. She hopes that this project will help the self-care aspect of welfare officer care improve and take off from the current state (Lundin, 2020).

In the book *På tal om e-hälsa*, Åsa Mäkitalo describes a potential future where the relation between patient and professional will be different than today, especially will the relation that rules today, that the patient uses the professionals at hospitals as a first-hand informational source change. She believes that the relation will be much more of a verificational relation where the professionals guide the patients through the mountains of information that is provided to us today, mainly through the internet (Mäkitalo, Erlingsdottir, & Sandberg, 2020). Welfare officer Lundin is also on this track and believes that with the help of more developed digi-physical tools, that this project will help to provide, the welfare officer care at SkaS will stay in the frontline of development and hence provide what patients really need (Lundin, 2020).

1.3 Problem description

On initiative by SkaS to make the welfare officer care services available to a broader range of patients than today and a recent initiative to include more welfare officer care services into many existing patient processes for various conditions, there has been an increase in the patient flows and work load on the welfare officers part. That has in its turn led to significantly lower availability seen from the total amount of addressable patients, than wanted. Added to this the Covid-19 pandemic has contributed to extending the prevailing waiting times due to prioritization of more acute matters.

Since SkaS is in no position of directly changing the region health care policies or budget, the need for service and process development within the welfare officer care has come to mind as a way of increasing the availability, the overall satisfaction of the treatments in general, and the welfare officer care in particular. SkaS has expressed their desire to approach this need through a digi-physical lens since they see potential there, but also since SkaS wants to integrate their social work and processes into the developing information society.

1.4 Aims

The aim of the thesis is to help SkaS develop their existing services for patients that are or will be subscribed to welfare officer care with a patient experience-based co-design perspective that increases the patient's overall satisfaction, empowerment, customization, and hence the availability of the treatment, without increasing the resources needed to provide the services significantly.

Furthermore, SkaS is seeking to develop their digi-physical services, not only within the welfare officer care that this project is focused on but in entire SkaS. The reason from SkaS perspective to develop their existing and non-existing digi-physical services is to keep up with the digitalized society and all that it brings and to stay relevant for patients in a world of rapid technological development.

The project is also an action in the direction along with the political goal that the Swedish government has set for Swedish e-health, namely *Vision e-health 2025* (Swedish-Government, 2021), which in short is described by the Swedish government as follows:

"The Year 2025 Sweden will be best in the world to use the possibilities of digitalization and e-health to help people get a good equal health and Welfare and also develop and strengthen their own resources for an increased independence and participation in the daily life of society"

1.5 Purpose and research questions

The purpose of the master's thesis is to deliver a thorough investigation on the welfare officer care stakeholders' needs for the future services at the welfare officer care department, a digiphysical process of the welfare officer care services, and a visual prototype of the main digital functions from the digi-physical process. The purpose of the thesis is also to deliver findings from the project that SkaS can use and learn from to get new knowledge and/or implementation suggestions of concrete actions that could help them increase the patient's overall satisfaction and empowerment of the treatment while increasing the availability without using sufficiently more resources than today. Furthermore, the project's purpose is to clarify what kind of help and support patients can get from the health care side when it comes to welfare officer care services.

The purpose described above can be more concretized as research questions of the master's thesis as follows:

- 1. What are the needs of the welfare officer care stakeholders for its future services?
- 2. How can the digi-physical process of the welfare officer care services be designed to satisfy the stakeholders' needs?
- 3. What are the main digital functions of the digi-physical services?
- 4. What future actions could be taken to realize the purpose laid out in section 1.5 Purpose and research questions.

1.6 Deliverables

The deliverables of the master's thesis are:

- A *Stakeholder's Needs List* for a digi-physical service pack at SkaS.
- A *Function Diagram* on a digi-physical process for the welfare officer care.
- A visual concept prototype of the main functions of the digital parts of the digi-physical process.
- An action plan to implement the digi-physical process for the welfare officer care department.

1.7 Limitations

The master's thesis extends over the period 210125-210614. This restriction is the most defining limitation to the project since it sets the ultimate time and thereby defining how much that could be fit in the project and carried out.

As seen in section 1.5 Purpose and research questions, no actual product will be delivered. The goal of the thesis is to deliver a concept model of how the welfare officer care services within SkaS can be designed to fulfill the purpose of the project. However, the demands for a complete product will be delivered. Besides that, a visual prototype of demonstrative value will be presented.

To carry out the master thesis, input from different stakeholders was needed. This input was from SkaS' part already to some extent articulated but not yet collected and summarized. The project was then limited to be mainly an investigation of what is actually desired from the digitalized welfare officer care by its stakeholders.

The Covid-19 pandemic ruling the world during this project was a limitation as well, especially in an input gathering phase where physical meetings, interviews, and tours on the hospitals could have been defining for the result of the thesis.

Apart from that, the executor of the project, SkaS, is a large organization and thus often have protocols on how to carry out projects in line with their statues, this reduces the flexibility of the project such as how fast a meeting with internal stakeholders can be set up or how fast a prototype concept model can be implemented for testing.

2. Method

This master thesis project used the DMADCL-method, a method for developing products, services, or systems. DMADCL is an acronym for *Define*, *Measure*, *Analyze*, *Design*, *Control*, and *Learn* where the different stages are carried out in named order, as seen in Figure 1. The DMADCL is a variant of the more famous PDSA method, which is an acronym for Plan, Do, Study, Act (Deming, 2021). Furthermore, DMADCL-method is a method based on the DMAIC-method, which in its turn is a variant of the Lean Six Sigma model (University-of-Bedfordshire, 2021). The final step of the DMADCL method, the Learn phase, originates from a case study thesis performed by Svante Lifvergren about quality improvement in health care (Lifvergren, 2013).



Figure 1. The used method for the master's thesis and each stage's outcomes

The reason for using the DMADCL-method was that the project group at SkaS was fairly familiar with it from previous work done in their domain and hence practical to use to make sure the communication between the parts involved would go smooth all through the project regarding the method.

2.1 Define

During the Define phase, the project is planned and concretized to the point where the problem area is known as well as the background, purpose, goals, limitation and time plan for the project (University-of-Bedfordshire, 2021).

In this project, the defining phase was carried out by gathering a project group at SkaS to set the scope and time plan. The scope and time plan was then iterated between Chalmers University of Technology (CTH) and SkaS until it met the requirements from both SkaS and the protocol for master theses at CTH.

After the Define phase, the final output is a project plan.

2.2 Measure

The Measure phase is the input gathering phase where the status of the product, service, or system is investigated. At the same time as the status is investigated, the stakeholders' needs for the later developed product are being mapped (University-of-Bedfordshire, 2021).

The stakeholders for the project were divided into three different categories, owner, user, and thesis performer where the owner are the ones taking responsibility for the project: the assigned project group at SkaS, CTH, and the performer. The users are the future users of the outcome of the project; the welfare officer care department at SkaS and their patients. The performer is

the one working on the project, assigned by CTH. A schematic view of the stakeholders is presented in Figure 2.



Figure 2. The project's stakeholders are divided and labeled Owner, User, and Performer.

To ensure a good outcome of the project it was decided to take input from all user groups. This means that input was gathered internally from employees at SkaS and then complemented these assessments by input gathered through interviews with patients.

The interviews were structured in two different ways, one for each user group where the main goal was to map out the patient's specific needs, SkaS' specific needs, and overall needs for developing a digi-physical concept for the welfare officer care. The amount and length of the interviews were 20 interviews and between 35 to 58 minutes each.

After every individual interview, which was recorded to be able to listen to them again, the thesis performer of the project collected the needs for the concept expressed during the interview. Furthermore, all interviewees were anonymous, but it was important that the interview group contained several professions and patients. The interviews were planned to contain the stakeholders seen in Table 1.

Interview category	Number of interviews
Patients with a chronic disease which treatment	11
potentially, or does contain Welfare officer care	
Welfare officers	3
Dieticians	1
Nurses	1
Occupational therapists	1
Consultants	1
Re-habilitation coordinatiors	1
Physiotherapists	1
Total number of interviews	20

Table 1. Interviewee category and the number of each individual within that category.

The questions for the interviews were built to create an environment where discussion was encouraged, they were also divided into four parts, an introductory part, a background part, a problematizing part, and an improvement part. The question templates were designed in Swedish since the interviews were carried out in Swedish. However, the questions are translated into English for the master's thesis report and are presented in both Swedish and English in Table 2 through Table 7.

The introductory questions are seen in Table 2. The introductory questions are questions to get the conversation started mixed with some practical questions about anonymity and recording of the interview.

Svenska	English
Inledande frågor, patient och SkaS	Introductory questions, patient and SkaS
Är det okej att samtalet spelas in?	Is it okay that the conversation is recorded?
Vill du vara anonym?	Do you want to be anonymous?
Hur gammal är du?	How old are you?
Vilka är dina erfarenheter inom vården?	What are your experiences within health
	care?

Table 2	Introductory	questions	both	natients	and	SkaS.
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In Table 3, the background questions to SkaS' employees are presented. The background questions are supposed to give the interviewer a good overview of the interviewee's experiences of health care and specifically the welfare officer care.

Svenska	English
Bakgrund, SkaS	Background, SkaS
Kan du beskriva händelseförloppet från det	Could you describe the sequence of events
att en patient söker hjälp till det att	from the time a patient applies for care until
behandling blir påbörjad?	the treatment is started?
Kan du beskriva händelseförloppet från det	Could you describe the sequence of events
att behandlingen är påbörjad?	from when the treatment is started?
Hur arbetar ni med uppföljning av patienter?	How do you work with follow-up on
	patients?
Hur ser er arbetsprocess ut?	Could you describe your work process?
Hur arbetar ni med personcentrerad vård?	How do you work with individual-centered
	care?
Hur ser ert patientflöde ut?	What does your patient flow look like?

In Table 4, the background questions for the patients are presented.

Table 4. Background questions asked the patients.

Svenska	English
Bakgrund, patient	Background, patient
Kan du beskriva händelseförloppet från det	Could you describe the sequence of events
att du sökte hjälp till det att behandling blev	from the time you applied for care until the
påbörjad?	treatment was started?
Kan du beskriva händelseförloppet från det	Could you describe the sequence of events
att behandlingen var påbörjad till nu?	from when the treatment was started until
	now?

, the problematization questions to SkaS' employees are presented. The problematization questions are supposed to shed light on general flaws and needs within the health care and specifically welfare officer care as well as mapping out some specific areas of interest.

Table 5. Problematization questions asked SkaS' employee
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Svenska	English
Problematisering, SkaS	Problematization, SkaS
Vilka brister ser du inom kuratorvården?	What flaws do you see in the welfare officer
	care?
Vilka brister ser du i den personcentrerade	What flaws do you see with individual-
vården?	centered care?
Ser du några behov hos patienterna som inte	Do you see any needs that are not met for
uppfylls idag?	the patients today?
Hur arbetar ni med patienternas utbildning	How do you work with the self-drive and
och egenkraft?	education of patients?
Hur bra koll anser du att patienterna har på	How well would you say that patients
hur ni kan hjälpa dem i början av deras	understand how you could help them at the
behandling?	beginning of their treatment?
Hur ser kuratorernas informationsstöd ut?	How does the information support look like
	for welfare officers?
Hur upplever du patienters nöjdhet efter en	How would you describe the satisfaction
tids behandling?	among patients after a period of time with
	treatment?

In Table 6, the problematization questions for the patients are presented.

Table 6. Problematization questi	ons asked the patients.
----------------------------------	-------------------------

Svenska	English
Problematisering, patient	Problematization, patient
Hur upplever du din vårdhistorik?	How would you describe your history
	within health care?
Vilka brister ser du inom vården och	What flaws do you see in health care and
specifikt kuratorvården?	specifically welfare officer care?
Hur tydlig tycker du att din behandling	How clear would you say your treatment
varit?	has been?
Hur är ditt förtroende för vården?	To what degree do you trust health care?
Upplever du att du varit med och påverkat	Do you feel that you have had an influence
din behandling?	on your treatment?
Hur upplever du att egenvården fungerar?	What are your thoughts on the provided
	self-care?
Hur arbetar du med egenvård?	How do you work with self-care?
Har du kompletterat din vård med något	Have you complimented your treatment
annat och isåfall vad?	with something else, and if so, what?
Känner du att du får svar på dina	Do you feel that your questions are being
funderingar av vården?	answered by the health care?
Finns det några behov som du anser att	Do you see any needs that you think the
sjukvården bör tillfredsställa men inte gör i	health care should satisfy that they do not
dagsläget?	do today?

In Table 7, the improvement questions are presented, the questions are the same for both patients and SkaS' employees. The purpose of the improvement questions is to spot hands-on needs and improvement possibilities for the health care but specifically the welfare officer care.

Svenska	English
Förbättringsfrågor, patient och SkaS	Improvement questions, patient and SkaS
Ser du några förbättringsmöjligheter för	Do you see any improvement possibilities
vården?	within health care?
Vad säger begreppet digi-fysiskt dig?	What is your understanding of the term digi-
	physical?
Hur ser du på en digi-fysisk framtid inom	What are your thoughts on a digi-physical
kuratorvården?	future within the welfare officer care?
Vilka fördelar och nackdelar ser du med en	What pros and cons do you see with a digi-
digi-fysisk kuratorvård?	physical welfare officer care?
Hur skulle du byggt en digi-fysisk	How would you build a digi-physical
kuratorvård?	welfare officer care?
Vad vet du om existerande digitala	What do you know about existing digital
vårdlösningar?	health care solutions?
Var tror du den bästa platsen att bygga en	Where do you think the best place to build a
digital plattform skulle vara?	digital platform is?
Hur inkluderar man de som inte kommer	How do you think one includes the ones that
använda de digitala lösningarna i en digi-	will not use the digital solutions within the
fysisk kuratorvård?	welfare officer care?

Table 7. Improvement questions asked both patients and SkaS' employees.

The final output of the Measure phase is unprocessed information from the stakeholders of the project.

2.3 Analyze

Once the input gathering is done, the next step is to analyze the data with regard to what limitations there are. This is done during the Analyze phase by sorting the needs into demands and wishes and then prioritizing them (University-of-Bedfordshire, 2021).

Furthermore, the demands and wishes are then turned into specific measurable metrics to be able to be measured in the Control phase. Finally, the *Target Specification* is created by adding target values to the metrics to be aimed at satisfying the stakeholders' needs.

For the project, this was done in four steps. First, all unique needs were put in a *Stakeholder's Needs List*, second, they were turned into a *List of Metrics* so that all needs could be measured. Third, a *Needs-Metrics Matrix* was created to graphically display which of the metrics that control which of the needs. Lastly, a *Target Specification* was created to be able to see what the target and approved values for the different metrics were. This process is further described in the book *Product Design and Development* (Ulrich, Eppinger, & Yang, 2020).

The *Stakeholder's Needs List* was structured in three degrees of abstractions, called primary-, secondary and tertiary needs in *Product design and development* (Ulrich, Eppinger, & Yang, 2020). The *Stakeholder's Needs List* also provides information about the degree of times it was expressed during the interviews, and how important the need was judged after asking SkaS' employees to prioritize them from one to six where six was the most important. Together with the prioritization and the degree to which the need was expressed in the interviews, the importance was graded from one to six, where six was most important. The weighting was then done by adding the two different terms together after multiplying the degree to which they were expressed in the interviews by two. The reason for multiplying the degree to which they were

expressed term by two is because it was originally graded on a scale from one to three instead of one to six. By multiplying it by two the different terms will be operating on the same scale.

The *Stakeholder's Needs List* for the project was created through four iterations where the first round was eliminating all doubles, the second round sorted them beneath different primary needs, the third round sorted secondary from tertiary needs, and the fourth round prioritized them.

From the *Stakeholder's Needs List*, a *List of Metrics* was derived. This list provides units on which the different needs can be evaluated on. Finally, from the *List of Metrics*, a *Target Specification* was done, which adds a target number of lowest acceptable performance to the *List of Metrics* and also states whether the need is a demand or a wish.

The demand-wish analysis was done by first taking all needs that scored a six in importance and make them a demand. The other needs that scored the rating of demand are qualified through the thesis performer's overall understanding of SkaS' perspective together with verification from the project group at SkaS.

The final output of the Analyze phase is the *Target Specification*.

2.4 Design

The design phase is where the new design is being generated. This is done by first setting up a *Function Diagram* like the one outlined in *Product Design and Development*, also known as *Function-Means diagram* (Ulrich, Eppinger, & Yang, 2020), based on the stakeholders' needs to see what functions the concept aims to enable, then solving each function separately with multiple solutions followed by combining the different solutions for the different functions to construct concepts that in theory would meet the *Target Specification*. Once a satisfying number of concepts have been generated they are put through an elimination and evaluation process where the elimination process eliminates all concepts that do not fulfill all demands stated in the *Target Specification* and the evaluation process compare the surviving concepts to each other to see which concept that performs best according to the *Target Specification* (University-of-Bedfordshire, 2021).

To come up with solutions to the *Function Diagram* a *Concept Combination Table* was used. This is like a *Morphological Matrix* but not necessarily graphically displayed (Ulrich, Eppinger, & Yang, 2020). Later the concepts were generated by adding solutions from the *Concept Combination Table* together, trusting the thesis performer's overall understanding of the process to ensure no valuable concept got undiscovered.

The concrete approach of generating solutions to the functions diagram was by looking at each function on its own and with the creative mind of the thesis performer, noting down possible ways of enabling that function on a piece of paper. The generated solutions to the function were then, after a refinement check two days later, noted down in a table, which in the concept generating step was used as the *Concept Combination Table*.

To see whether all generated concepts met the demands an *Elimination Matrix* was used. An *Elimination Matrix* is a matrix where you compare each concept to the demands of the services and remove those concepts not fulfilling one or more demands (Ulrich, Eppinger, & Yang, 2020). The concepts that survived the elimination process were then evaluated to each other using a variant of a *Kesselring Matrix* (Ulrich, Eppinger, & Yang, 2020) and a *Pugh Matrix*

(Virginia-Tech, 2021), we call it *Mixed Scoring Matrix*, where all remaining concepts are being compared to one of the concepts set as reference. This was done in two iterations with two different references to verify that the result was solid.

The point of the evaluation was to narrow the concepts down to as few as possible for the resources of the project to be placed as effectively as possible, focusing on the best concepts only, when entering the Control phase.

To be able to evaluate the concepts to each other on different criteria, the different criteria must be weighed by importance so that the most important criteria gives the most points. That was done in a *Criteria Weighing Matrix*, which compares the criteria pairwise.

When the best suitable concepts were chosen and decided to work further with, they were refined and combined to be even more suited for the project.

When leaving the design phase, the final output is the chosen concept(s).

2.5 Control

In the control phase, the prototype is being built and tested to see if the concept satisfies the *Target Specification* (University-of-Bedfordshire, 2021).

The prototype of the concept was conceptually sketched with functions for the different steps in the process using a *Function Diagram*. In addition, a visual demonstration prototype of a phone application that will assist SkaS' journey to be more digitalized, was built. Furthermore, an evaluation was done to verify that the visual phone application prototype met the demands in the *Target Specification*.

The phone application was done by first creating a product function log where all functions from the *Function Diagram* were used as a checklist. The function log was also based on the demands from the *Target Specification* as well as some other features that were added, after verification from the project group at SkaS, to make sure the visual value of the prototype was optimized.

The evaluation of the visual phone application prototype was done by using the demands from the *Target Specification* as a checklist and noted if the demands were fulfilled. If a demand was not fulfilled, a comment was left so it will be easy for future projects to see the potential flaws with the design.

The outcome of the Control phase are the prototype(s) and prototype evaluation.

2.6 Learn

The last phase of the cycle is the Learn phase where the purpose is to learn from what has been done to improve the product even more in the next iteration. This is done not only by analyzing the results from the testing but also by learning the process to be able to work in a systematic and documented way (University-of-Bedfordshire, 2021). After this phase, the project can go back to either the analyze-, design, or define phase depending on what conclusions are drawn from the learning phase.

The learning part of this master's thesis project is stated in the master's thesis report together with a list of recommended future work based on this project.

3. Results

The Results chapter will present the situation with the current exploitation of digi-physical tools at SkaS, the interviews, the needs analysis, the *Function Diagram*, the idea generation, the concept generation, the concept evaluation, and the prototypes.

3.1 The current exploitation of digi-physical tools at SkaS' welfare officer care department

From personal communication with welfare officer Margaretha Lundin at SkaS, the situation today at SkaS is that four different digi-physical tools are being used within the welfare officer care. These are phone calls via the internet and traditional telephone network, the application *1177 Vårdguiden*, the application *Mitt vårdmöte – VGR*, and traditional physical meetings. The different tools are being used to a varying extent, very much dependent on the welfare officer and patient's agreements and prerequisites (Lundin, 2020).

The different tools are used for different services. The phone calls are most often used for short errands and is a substitute for physical meetings. *Mitt vårdmöte -VGR* is an application that enables video chat with the welfare officers hence replacing the physical meeting to a larger extent than a traditional phone call. *1177 Vårdguiden* provides information about illnesses and diseases, but mostly used within the welfare officer care it is a tool to be used for the patient to get access to their journal via the internet.

Since there is no official digi-physical service pack for the patients to take part in, one significant outcome this project has is to shed light on what compliments or substitutes there might be to the traditional way of taking part in welfare officer care. Another possible improvement is that with this project, all digi-physical services could be gathered at one place, making it easier for the patients to get an overview of services available and their own ongoing treatment.

The degree to which patients use different self-care tools within the welfare officer care today is dependent on what welfare officer the patient is subscribed to. If the welfare officer is very competent within the area of self-care, they can easily educate the patient, whereas a welfare officer with less competence within the self-care area might not even talk about it with the patient. There would, due to this, be of great value to the patients if the self-care could be more available since more patients would probably benefit from it.

3.2 Needs analysis

In the needs analysis chapter, the *Stakeholder's Needs List*, *List of Metrics*, and *Target Specification* are presented.

3.2.1 Stakeholder needs list

The *Stakeholder's Needs List* contains 118 needs collected from 20 unique interviewees and can be seen in Appendix A – *Stakeholder's Needs List*. The *Stakeholder's Needs List* provides information about the stakeholders' needs, the degree to which the need was expressed in the interviews, the importance of the need, and who the stakeholder of the need is. The number of primary needs listed in the *Stakeholder's Needs List* is seven with varying numbers of secondary and tertiary needs beneath them, this is seen in Table 8.

Primary need	Number of secondary needs	Number of tertiary needs
Increase availability of the Welfare officer care	9	11
Enable patient control of treatment	15	4
Provide excellent self-care	8	21
Provide excellent information availability	16	1
Enable user-friendly digital parts	13	0
Enable digi-physical meetings	7	2
Improve healthcare	11	0
Total number of needs	79	39

Table 8. Primary needs and their number of descendants.

In the *Stakeholder's Needs List*, the primary needs are in the column *primary needs*, and the secondary and tertiary needs are in the column *needs*. However, the secondary needs are written in standard letters whereas the tertiary needs are italicized and slightly moved to the right.

The most frequently expressed needs are seen in Table 9 as well as the importance of each need rated by SkaS. Furthermore, the absolute importance, as well as the rounded importance, can be seen.

	Table 9. The	most frequently	expressed	needs in	the	Stakeholder	's	Needs	List
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Needs	Level of occurance in interviews (1-3 [x<5, 5= <x<8, x="">=8])</x<8,>	Average importance from hospital	Importance	Rounded Imp.
Have a booking system for both first time appointment and follow-up meeting	3	6	6,0	6,0
Enable message service	3	5	5,5	5,0
Enable patients to find rehab activities	3	4	5,0	5,0
Provide education, lectures, and events digitally or physically	3	3	4,5	4,0
Enable easy access self-care tools	3	6	6,0	6,0
Provide information about professions externally	3	6	6,0	6,0
Provide education programs for the most common used digital applications and tools	3	2	4,0	4,0
Use an easy and intuitive interface with evident icons	3	6	6,0	6,0
Enable integrability to already existing platforms	3	6	6,0	6,0

As seen in Table 9, there are nine needs that were expressed during the interviews eight or more times. Comparing the level of occurrence to the importance rated by SkaS we see that even though something was on top of the mind of the interviewees, SkaS did not necessarily find it very important. The clearest example is the need *Provide education programs for the most common digital applications and tools*. It was one of the most occurring needs during the interviews, but when rated by SkaS afterward it did only score two out of six points.

One possible explanation for the large gap between the level of occurrence and importance from SkaS might be that the interviewees and SkaS could have different perspectives on who the responsibility of educating people with low competence in digital applications and tools falls upon. While the interviewees might think it is obvious that SkaS must educate their users in the tools they provide, SkaS might think that it will take up too much of their resources and that they are only responsible for delivering the services.

Whether it is SkaS' responsibility or not to educate their users is not a question for this thesis. However, that there is a large need for education of digital applications and tools is something that probably could be permeating the entire society which makes it an important insight. What one could say, however, is that if the welfare officer care services should be designed with a co-design approach, both parts need to be listened to. Ultimately, it is the patients that will use the services, and designing services only to a few of the patients can not be seen as effective.

The overlap of the rated importance from SkaS and the needs that scored a three on occurrence, which is the highest degree of occurrence, is not large. Only five of the listed needs scored a six in importance. These are to provide a booking system, to provide easily accessible self-care tools, to provide clear information about different professions at SkaS, to use an easy and intuitive interface with evident icons on a potential platform, and that a potential platform should have integrability with already existing platforms.

To provide a booking system is something that is partially in practice already today through different platforms to the health care in Sweden, however, it is not of great surprise that this is the first need to score a six. It is both hands-on, very practical, and something that is to some degree tested and liked among patients. The easily accessible self-care tools, however, is a need that is underdeveloped today. Self-care is an area in which the patient is the commander of the treatment and it is probably one of the reasons that it is underdeveloped, not because the patients' are incapable of taking responsibility but since SkaS has been focusing on things that the patients cannot provide themselves with.

Self-care is, even though it might be underdeveloped, something that can raise the wellbeing among individuals before, or after diagnosed with an illness that might require long-term treatment. Even for healthy and non-ill individuals, self-care can be of great utility. By providing proven and quality assured self-care methods and tools on the behalf of SkaS, and other hospitals for that matter, there might, and probably will be cases where patients will not even have to apply for help from hospitals (Lundin, 2020).

The fact that the need for self-care is one of the most occurring needs, and highest rated from SkaS, is due to above stated reasons a fuel to the development of it. It is also a pointer towards the willingness of patients to take responsibility for their own health, which is great since it could lead to better wellbeing for a lot of people, without even costing any resources from the health care.

The need of providing information about the professions at SkaS is a sign of unclarity from SkaS. It tells us that it is something that the interviewees want, to a large degree and range, but is not provided. The fact that SkaS in their turn also rates this as a six tells us that this probably was known on beforehand. This is further verified by Margaretha Lundin, Welfare officer at SkaS, who tells us that the welfare officer role of today is not only unclear to the patients but also internally at SkaS, where the different working approaches from different welfare officers vary enough that other departments and professions at SkaS do not know exactly what services they provide (Lundin, 2020).

The last two needs that scored a six in importance are both related to a potential platform developed by SkaS. The need for having an intuitive and easy interface with evident icons implies that there is a fear from the interviewees that a digital platform could be developed in a way that is too hard to understand, at least when compared to the value it might add. The

second need here, to enable integrability to already existing platforms, add to that implication. By taking the stand in already existing, and hopefully known and understood platforms the knowledge gap will not be as large to bridge.

These two last needs with an importance of six are not only expressed by fear from the patients. It is obvious that if the skill of using the potential platform, which is not related to medical or health care knowledge or skill, is too hard for the patients, it will probably be too complicated for the employees at SkaS as well. A situation like that would not be of benefit to anyone. It is therefore not of surprise that these two needs scored the highest importance.

3.2.2 List of Metrics

The *List of Metrics* contains 121 different metrics with the purpose to be able to verify the ability to satisfy the stakeholder needs. The reason for having 121 metrics to 118 needs is that during the process of creating the *List of Metrics*, some needs were discovered to contain more than one need or way of measuring it. The needs which have multiple metrics are number 48, 52 and 87. Each metric has a unit of which one can evaluate the metric and thereby also the underlying needs. In the *List of Metrics*, seen in Appendix B – *List of Metrics*, no metrics for the primary needs from the *Stakeholder's Needs List* are seen. This is because all primary needs in their turn contain the secondary needs with their metrics, which are seen written with standard letters, and the tertiary needs metrics, written in italicized letters and moved slightly to the right.

As seen in Appendix B – *List of Metrics*, there are many metrics which unit is *Binary*. That means that either it will be fulfilled, or it will not. When working with product design and development this is not optimal, one wants to have as few of these as possible to be able to evaluate different concepts more precisely and objectively (Ulrich, Eppinger, & Yang, 2020). Furthermore, the *List of Metrics* provides clear information on which need in numerological order from the *Stakeholder's Needs List* the metric is supposed to measure.

3.2.3 Target Specification

The *Target Specification* is the final part of the measure and analyze stage and is a sequel to the *List of Metrics*. Its purpose is to provide information about what the accepted and wanted values of the metrics are, displayed as *Marginal value* and *Ideal value*. Furthermore, it provides information on whether the metric and hence the need it is measuring is a requirement or a wish for the final delivery. Both the marginal value and the ideal value of each metric are derived from the thesis performer's understanding and underlying information of the need. Lastly, the *Target Specification* unlike the *List of Metrics* also provides information about how the verification of the metric will be done, how it will be tested that is. The *Target Specification* is seen in Appendix C – *Target Specification*.

From the demand-wish analysis done during conversion from the *List of Metrics* and the *Target Specification*, we can see that the actual demands for the final delivery are 17. The demands in the *Target Specification* are seen in Table 10 where the metric number, need number, metric and if it is a demand (D) or wish (W) can be seen.

Metric	Need		
No.	Nos.	Metric	D/W
1	1	Have a booking system for both first time appointment and follow-up meeting	D
2	2	Have an errand application function	D
7	7	Enable message service	D
28	28	Enable work with personal goals	D
35	35	Enable to switch between digital and analog treatment during treatment time	D
39	39	Enable intact overview of patient well being for the hospital	D
		[Enable data gathering for patient]	
55	53	Owner of the data must be trustworthy	D
		[Enable patient to get motivated in his/her self-care]	
58	56	Provide a fast introduction to mental self-care after chronical diagnose	D
61	59	Enable easy access self-care tools	D
71	69	Provide quality assured information	D
72	70	Provide regular updates of information	D
74	72	Provide information about professions externally	D
86	84	Provide information on how to do some "easy things" yourself that welfare officers provide today	D
91	88	Use an easy and intuitive interface with evident icons	D
92	89	Enable integrability to already existing platforms	D
102	99	Enable physical tests and evaluations	D
103	100	Enable good alliance between patient and hospital	D

Table 10. All demands from the Target Specification for the final delivery.

The italicized demands in Table 10 are demands that will follow if the above need within the box parenthesis is realized. As seen, no metric- or need number is presented on the metrics within box parenthesis. That is to make it more clear to the reader that something particular is happening at those places.

3.3 Function diagram

The *Function diagram* seen in Figure 3 takes the perspective of a patient recently diagnosed with a chronic disease and faces the process that this master's thesis aims to solve, further described in chapter 1. Introduction. The light green boxes are the different functions that the process will enable, and the dark green boxes are what the solutions will be to solve the above function. Three of the dark green boxes are already determined. They are determined since they are out of the scope of this master's thesis. However, most of the dark green boxes are not determined but instead named *Solution* (x). The number after *Solution* reaches from one to five and is printed out to be able in a later stage to separate the solutions easier from each other. For solution three, four and five, there are two places each where the solution appear which means that the same solution will be solving the same function but at different places in the *Function Diagram*.



Figure 3. The Function diagram of a patient's point of view after being diagnosed with a chronic disease, where the light green boxes are the functions and the dark green boxes are what the solutions to the functions are.

The reason that function *Get introduced to self-care* is presented twice in the *Function Diagram*, Figure 3 is that all patients will not have the exact same journey in the *Function Diagram*. For one patient there might be possible to not get in touch with a welfare officer but the need for getting introduced to self-care could still be there. Therefore, after *Get introduced to welfare officer care* the patient will, at the same time he/she can apply to the welfare officer care, be introduced to self-care.

At the other end, a patient might want to get in touch with a welfare officer and for any reason misses the first introduction to self-care. If so, the patient will anyways be introduced once again after the first introduction with a welfare officer.

As seen in Figure 3, *solution* (4) is seen two times. At *Contact with welfare officer* and at *Get follow-up*. The reason is that the follow-up is a contact with the welfare officer and hence the same solution will be applied to both functions.

The *solution* (5) is also seen twice. It is solving the same function but at different stages in the *Function Diagram* and the reason, again is that different patients might have different walks down the *Function Diagram*, depending on whether they apply to the welfare officer care or not.

3.4 Idea generation

The solutions to the functions seen in Figure 3 were generated into a *Concept Combination Table*, seen in Appendix D – *Concept Combination Table*. There were five different functions to generate solutions to. These functions are displayed in Table 11. The *Concept Combination Table*, which purpose is to combine function solutions into a complete concept is not used in this step. The purpose of the *Concept Combination Table* used in the idea generation phase is purely documentational but practical since it eliminates the time waste of transferring documented solutions from one table to another.

Table 11. The functions of the digi-physical process and the number of generated solutions to each function.

Function	Number of solutions
Get Informed of Welfare officer care	8
Apply to Welfare officer care	7
Get introduced to Self-care	9
Contact with Welfare officer	2
Get Self-care	6

3.4.1 The generated solutions

In the generated solutions section, the solutions to the functions seen in Table 11 are presented and explained.

Get informed of welfare officer care

Get informed of welfare officer care is the function that enables the patient to get informed that welfare officer care is available to them after diagnosed with a chronic disease where welfare officer care is available.

Phone call

The phone call solution means that every newly chronically disease diagnosed patient will get a phone call from a welfare officer that informs of the services of the welfare officer care.

Traditional text

Traditional text means SMS, e-mail, and mail. Every patient gets informed by one or several of these means.

By serving doctor

The patients get informed by the doctor that is serving them when diagnosed.

Information on hospital exclusive account

The patients get informed by logging into an own internet-based platform.

(Online) Brochure

The patients get informed by getting a brochure, either online or offline with information about the welfare officer care.

Social media group information for each special treatment department

After diagnosis, every patient gets invited to a social media group that will be responsible for telling every patient about welfare officer care.

Introduction lecture

Every patient is invited to an introductory lecture on their disease where they are informed of the welfare officer care.

Display throughout hospital

The patients get informed by seeing information placed on screens throughout the hospital.

Apply to welfare officer care

The apply to welfare officer care function is the function enabling the patient to apply to the welfare officer care at SkaS after being diagnosed with a chronic disease where welfare officer care is available.

Online form application BankID

Application through a set up internet-based place where you sign in with BankID.

Phone call time booking

Patients call the welfare officer care department and apply by phone.

E-booking

The patients log in on an internet-based page and booking an available time slot to meet a welfare officer.

Traditional text application

The patients send a text application to the welfare officer care department by SMS, e-mail, or mail.

Chat application

The patients apply by chatting with the welfare officer care department through text in an internet-based solution.

IRL drop-in

The patients go physically or digitally to a welfare officer care drop-in.

Online form application exclusive account

Patients apply by logging into a hospital-owned platform with an exclusive account received after diagnosis.

Get introduced to self-care

The get introduced to self-care function is the function enabling the patients to get introduced to self-care after being diagnosed with a chronic disease where welfare officer care is available.

Phone call after application

The patients get informed by a welfare officer that calls them after diagnosis.

Traditional text after application

The patients get informed by SMS, e-mail, or mail.

(Online) Brochure

The patients get introduced by getting a brochure, either online or offline.

By welfare officer after contact

The patients get informed by a welfare officer after application and admittance at a meeting.

Outsource to patient organizations

The patients get informed by local patient organizations that are responsible for informing the patients.

Introduction lecture

The patients are introduced during an introduction lecture to which they are invited after diagnosis.

Social media group information

The patients get informed by a social media group to which they are invited after diagnosis.

Information on hospital exclusive account

The patients get informed by logging in to a hospital-owned platform with an exclusive account received after diagnosis.

Displays throughout hospital

The patients get informed by looking at displays throughout the hospital.

Contact with welfare officer

The contact with welfare officer function is the function enabling the contact with the welfare officers.

Digi-physically with own platform

Patients and welfare officers meet both digitally through an own internet-based platform and physically at SkaS.

Digi-physically with existing apps

Patients and welfare officers meet both digitally through already existing internet-based platforms and physically at SkaS.

Get self-care

The get self-care function is the function that enables the patients to receive self-care tools to be able to get benefits from self-care.

Own interactive platform

Patients use an internet-based hospital-owned platform.

List of good links and literature

Patients get a list of good links and literature that they can use for their self-care. These links and literature are verified and decided by SkaS. The list can be either online or offline.

Schedule from hospital

The patients get a schedule with different self-care tools to use in a specific order.

Educated by welfare officer

The patients get educated by a welfare officer if attending welfare officer care.

Outsource to patient organizations

The patients group up at local patient organizations and educate each other and recommend different self-care tools to each other.

(Online) Brochure

Patients get a brochure with self-care content either offline or online.

3.5 Concept generation

The concept generation was done using the *Concept Combination Table*, seen in Appendix D – *Concept Combination Table*, and resulted in a total number of generated concepts of 10. The concepts are named 1-10 and the results are seen in Appendix E – *Generated Concepts*.

The *Concept Combination Table* lays out the functions which constitute the object that is developed, in the first row. Then beneath every function, the solutions which solve the specific function are listed in a column. Then by taking solutions from every column, which do not conflict, and adding them together, a concept is generated.

The concepts are supposed to be places into the model seen in Figure 3. An example of how it could look like is provided in section Concept 1.

All concepts enable the *Get informed of welfare officer care* at least by the serving doctor solution, the *Apply to welfare officer care* at least by phone call time booking and *Get Self-Care* at least by education by welfare officer. This is because of the demand for the services to not exclude individuals that for some reason do not use digital tools. These fixed solutions do not conflict with any other solution that is enabling these functions which makes it possible to have more than one solution enabling these functions in one concept.

The different concepts generated in this project and the idea behind them are described in section Concept 1 through Concept 10.

Concept 1

The first concept was combined to be a stripped concept. That means that the idea behind it was to use as few non-established solutions as possible.

For the first concept an example of how a concept looks like, both when describes as solutions to functions, Figure 4, and when integrated into the *Function Diagram* seen in Figure 3, Figure 5 are presented.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Phone call	
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Traditional text after application	Digi-physically with existing apps
Self-Care	
Educated by Welfare officer	

Figure 4. Concept 1, generated and ready to be integrated into the function diagram.

The concept is in practical terms already implementable today if the resources and personnel were enough. The only requirement from the patients' part is to own, or at least have access to a phone with call and text functions.

When the concept is fully constructed, it can be integrated with the *Function Diagram* seen in Figure 3.



Figure 5. Concept 1 integrated with the Function Diagram.

Concept 2

The second concept is based on the idea to separate the functions from each other as much as possible to see if that would be beneficial. That means having different platforms enabling each function. For example, the application to the welfare officer care is done through an online form while the self-care is enabled on an own interactive platform. The second concept is seen in Figure 6.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Traditional text	Online form application BankID
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Traditional text after application	Digi-physically with existing apps
Self-Care	
Educated by Welfare officer	
Own interactive platform	

Figure 6. Concept 2 from the concept combination table.

The third concept is based on the idea to have a brochure that can be both online but also offline where patients get information. The application and the meetings will be done through other platforms. The third concept is seen in Figure 7.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
(Online) Brochure/ List of available services	Online form application BankID
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
(Online) Brochure/ list of available services	Digi-physically with existing apps
Self-Care	
Educated by Welfare officer (Online) Brochure/ List of available services	

Figure 7. Concept 3 from the concept combination table.

Concept 4

The fourth concept is based on the idea that SkaS will develop their own platform to provide most of the functions. However, the platform will be informed of through traditional text after diagnosing from specialist care. The fourth concept is seen in Figure 8.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Traditional text	Online form application exclusive account
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Information on hospital exclusive account	Digi-physically with own platform
Self-Care	
Educated by Welfare officer Own interactive platform	

Figure 8. Concept 4 from the concept combination table.

The fifth concept builds on the participation from local patient organizations and their motivation to keep social media groups active and also to provide education for patients invited to the groups. From SkaS part, they will with this concept have to implement an e-booking system. The concept is seen in Figure 9.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Social media group information for each special treatment departm	E-booking
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Social media group information	Digi-physically with existing apps
Self-Care	
Educated by Welfare officer	
Outsource to patient organisations	

Figure 9. Concept 5 from the concept combination table.

Concept 6

The unique part about the sixth concept is that it enables the application to the welfare officer care through text chat application. It also differs in the enabling of self-care since it will provide a list of good links and literature for the patients to be educated themselves. The sixth concept is seen in Figure 10.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Traditional text	Chat application
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Traditional text after application	Digi-physically with existing apps
Self-Care	
Educated by Welfare officer	
List of good links and litterature	

Figure 10. Concept 6 from the concept combination table.

The seventh concept is testing the idea of having an introduction lecture for all newly diagnosed patients where they will be informed of welfare officer care and also introduced to self-care. It also tries the idea of letting the local patient organizations run the self-care part of the concept. The seventh concept is seen in Figure 11.

Informed of Welfare Officer Care	Apply to Welfare Officer Care					
By serving doctor	Phone call time booking					
Introduction lecture	E-booking					
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up					
Introduction lecture	Digi-physically with existing apps					
Self-Care						
Educated by Welfare officer						
Outsource to patient organisations						

Figure 11. Concept 7 from the concept combination table.

Concept 8

The eighth concept is a combination of providing an online and offline brochure to the patients, but besides that build an owned platform for the self-care part. The eighth concept is seen in Figure 12.

Informed of Welfare Officer Care	Apply to Welfare Officer Care					
By serving doctor	Phone call time booking					
(Online) Brochure/ List of available services	Online form application BankID					
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up					
(Online) Brochure/ list of available services	Digi-physically with existing apps					
Self-Care						
Educated by Welfare officer						
Own interactive platform						

Figure 12. Concept 8 from the concept combination table.

The ninth concept tries the idea of letting the specialist care doctors be fully responsible for informing the patients about welfare officer care. The difference from today's methods is that it also provides an own platform where the other functions will be enabled. The ninth concept is seen in Figure 13.

Informed of Welfare Officer Care	Apply to Welfare Officer Care				
By serving doctor	Phone call time booking				
	Online form application exclusive account				
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up				
Information on hospital exclusive account	Digi-physically with own platform				
Self-Care					
Educated by Welfare officer					
Own interactive platform					

Figure 13. Concept 9 from the concept combination table.

Concept 10

The tenth concept provides an online and offline brochure for self-care but also sets up an online application form for the welfare officer care. Other than that, the concept is taking advantage of traditional text technology. The tenth concept is seen in Figure 14.

Informed of Welfare Officer Care	Apply to Welfare Officer Care					
By serving doctor	Phone call time booking					
Traditional text	Online form application BankID					
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up					
Traditional text after application	Digi-physically with existing apps					
Self-Care						
Educated by Welfare officer						
(Online) Brochure/ List of available services						

Figure 14. Concept 10 from the concept combination table.

3.6 Concept evaluation

In the concept evaluation section, the elimination and concept comparison will be presented. Furthermore, the refinement of the chosen concepts will be presented and lastly, the final chosen concept is presented.

3.6.1 Elimination matrix

From the *Elimination matrix*, seen in Figure 15, six of the original 10 concepts survived, these being 2,3,4,8,9, and 10. The *Elimination Matrix* shows which concept it is evaluating, what is considered when evaluating if they complete the elimination criterion and if not, a comment on why is noted. If a concept successfully fulfil an elimination criterion, it is marked with a +, if it does not, a -, and if the information is insufficient it is marked with a ?. In the column *Decision*, the accepted concepts are marked with + and the unaccepted with -. Those concepts accepted will be further evaluated.

Elimination matrix:			Criteria fulfilment:				
					(+) Yes		
						(-) No	
						(?) More info needed	
						(!) Check with specification	
						Decision:	
		su				(+) Continue	
	E	ima	able		a	(-) Remove	
	ble	l de	liz	cost	atio	(?) More info needed	
	pro	lal	Rea		rms	(!) Check with specification	
	ain	lifi	ble/	ole	ufo		
	Ĩ,	ofi	atil	nal	ţh i		
	lve	ole t	du	aso	ŝno		
Concept alternative	So	Ab	ಲಿ	Re	En	Comment	Decision
1	-					Does not save time for SkaS	-
2	+	+	+	+	+		+
3	+	+	+	+	+		+
4	+	+	+	+	+		+
5	-					Social media will not guarantee anonymity	-
6						Chatting in early stage will be more time demanding	
	-					Depending on patient organisations will not enable	-
7						a long-term flexibility of the Welfare officer care it	
/	+	+	?			will also not be able to control the outcome to see the feasibility	-
8	+	+	+	+	+		+
9	+	+	+	+	+		+
10	+	+	+	+	+		+

Figure 15. Elimination matrix sorts accepted concepts away from unaccepted on five different elimination criteria.

The concepts which were eliminated in *Elimination Matrix* were 1, 5, 6, 7. Concept 1, the stripped concept, falls on the first criterion, to solve the main problems. The part of the main problem seen in section 1.3 Problem description that the concept does not solve is the resource usage part. It states clearly that SkaS will not be able to affect politics and thereby not receive any more resources. By letting a welfare officer call every new patient by phone to evaluate whether they will need welfare officer care or not is not effective since there are a lot of patients that for any reason would not want welfare officer care. Due to that reason concept 1, which includes informing every new patient of the available welfare officer care services through a phone call, is eliminated.

Concept 5 which depends on social media to inform patients of welfare officer care and selfcare has too unknown rules when it comes to anonymity for the concept to be approved by SkaS.

Concept 6, based on using text chat applications, falls on the time-saving aspect where the application to the welfare officer care will be done through text chat. This solution is, by its time-demanding nature, which is that it takes longer time to say a sentence than it takes to write it down, not saving any time and hence not increasing the availability for the majority of patients. Therefore, it is eliminated.

Concept 7, based on an introductory lecture and local patient organizations, is eliminated due to uncertainty. The solution is untestable on beforehand since it is impossible to know whether the infrastructure of local organizations is good enough to bear the responsibility of the self-care part of the welfare officer care without long-term testing. It is also, from SkaS point of
view, impossible to control and guarantee the quality of the self-care provided by the local organizations.

The survived concepts from the *Elimination Matrix* were 2, 3, 4, 8, 9, 10.

3.6.2 Concept comparison

The survived concepts from the *Elimination Matrix* were compared to each other in a *Mixed Concept Scoring Matrix* to find the best concept, but to be able to use the *Mixed Concept Scoring Matrix*, the criteria need to be weighed against each other in a *Criteria Weighing Matrix*.

Criteria Weighing Matrix

In the *Criteria weighing matrix*, the weight/importance of the different functions displayed in Table 11 are being set. This is done by comparing each function to every other, pairwise, writing 0 in the box if the function is less important than to the compared function, 1 if more important, and 0.5 if equally important. The comparison is done comparing the function stated in the row to the function stated in the column. The column Σ is the sum of the points received and the column Σ Ref is the sum divided by 10 to get its percentage importance compared to the other functions. The results are seen in Figure 16.

	Informed of Welfare Officer Care	Apply to Welfare officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care	Σ	Σ Ref
Informed of Welfare Officer Care	-	0,5	1	0	1	2,5	0,25
Apply to Welfare officer Care	0,5	-	1	0	1	2,5	0,25
Get introduced to Self-Care	0	0	-	0	0	0	0
Contact with Welfare Officer / Follow-up	1	1	1	-	1	4	0,4
Self-Care	0	0	1	0	-	1	0,1

Figure 16. The functions of the process are compared to each other one by one.

The ranking of the pairwise comparison was done through logical reasoning. The most important is the contact with the welfare officer since it does not matter to what degree people receive welfare officer care if it will not benefit them.

Secondly, on shared place comes the informing and application to welfare officer care. The reason these two are equally important is that they both tie together in their result of getting a patient to get in touch with a welfare officer. If they are not informed, they will most probably not get any welfare officer care, and if it is impossible to apply, they will not get any welfare officer care either.

In fourth place comes self-care, which is more important than the informing of it because the ones receiving it should benefit from it or it will not gain anyone. It is also less important than

getting in contact with a welfare officer since the traditional welfare officer could provide, to the patients they get in touch with, help on the self-care parts.

As a consequence of above stated scoring, the introduction of self-care comes at last place.

In Table 12 the outcome of the *Criteria weighing matrix* is displayed. As seen, the most important of the functions is *Contact with Welfare officer*.

Function	Points	Rank
Informed of Welfare officer	2.5	2
care		
Apply to Welfare officer	2.5	2
care		
Get introduced to Self-care	0	5
Contact with Welfare officer	4	1
Self-care	1	4

Table 12. Each function of the process ranked by points scored in the Criteria weighing matrix.

Mixed Concept Scoring Matrix

The final comparison of the concepts was done in two iterations, using a *Mixed Concept Scoring Matrix*. The result of the first iteration is seen in Figure 17. In the *Mixed Concept Scoring Matrix*, the concepts are being compared to each other based on how well they fulfill the functions criteria of the process seen in Figure 3. To get a worthy comparison, one of the concepts is chosen as reference and then the other concepts are being evaluated against that one. The *Mixed Concept Scoring Matrix* shows how many points each concept got as well as the rank. Lastly, a decision to go further with the concept is done by writing an *X* in the *Further development* row if considered good enough. In this project, three concepts will be taken to further work.

From the first iteration, it turns out that concepts 4, 8, and 9 will be worked further with.

			N Alternative N m 4 ∞ ∞ 1 0 1 -1 1 R 0 1 0 1 1											
Criterion	Weight	2	3	4	8	6	10							
Informed of Welfare Officer Care	25		1	0	1	-1	0							
Apply to Welfare officer Care	25	R	0	1	0	1	0							
Get introduced to Self-Care	1	Е	1	1	1	1	0							
Contact with Welfare Officer / Follow-up	40	F	0	1	0	1	0							
Self-Care	10		-1	0	0	0	-1							
	$\sum +$	0	2	3	2	3	0							
	$\sum 0$	0	2	2	3	1	4							
	Σ-	0	1	0	0	1	1							
	Weighted total	0	16	66	26	41	-10							
	Ranking	5	4	1	3	2	6							
	Further Development			Х	Х	Х								

Figure 17. The first round of concept scoring with concept 2 as reference.

The second iteration was done to verify the first result to make sure no mistakes were made. This was done by setting the winning concept of the first iteration as reference.

The outcome of the second iteration resulted in the same ranking of the concepts as iteration one and is seen in Figure 18.

			Alternative											
Criterion	Weight	5	3	4	8	6	10							
Informed of Welfare Officer Care	25	0	1		1	-1	0							
Apply to Welfare officer Care	25	-1	-1	R	-1	0	-1							
Get introduced to Self-Care	1	-1	-1	Е	-1	0	-1							
Contact with Welfare Officer / Follow-up	40	-1	-1	F	-1	0	-1							
Self-Care	10	0	-1		0	0	-1							
	$\sum +$	0	1	0	1	0	0							
	$\sum 0$	2	0	0	1	4	1							
	Σ-	3	4	0	3	1	4							
	Weighted total	-66	-51	0	-41	-25	-76							
	Ranking	5	4	1	3	2	6							
	Further Development			Х	Х	Х								

Figure 18. The second round of concept scoring with concept 4 as reference.

In Table 13 the survived concepts from the *Mixed Concept Scoring Matrixes* are shown and are the concepts that will be worked further with.

Table 13. The	survived	concepts	after	Mixed	Concept	Scoring	Matrix.
1000 15. 100	Surviveu	concepts	ajici	mincu	concept	Scoring	munn.

Su	rvived concepts after Mixed
	Concept Scoring Matrix
	4
	8
	9

3.6.3 Refined final concept

Since none of the generated solutions of each function in the winning concepts are incompatible with any of the other solutions generated for the other concepts, the three winning concepts can be combined and thereby optimized to be one final best concept. By looking at how well the different winning concepts scored against each other on different criteria in Figure 17 and Figure 18 the optimal concept is found.

The final concept is seen in Figure 19 and uses concept 4 as a base but switches the solution which is used to inform patients of welfare officer care from *Traditional text* to (*Online*) *Brochure*.

Since the brochure in the case of the refined concept will be used as introduction information to patients about welfare officer care and also self-care, the brochure is changed to be a pocket card brochure. The reason for changing is because the information of introducing a patient to welfare officer care and self-care can be more efficiently spread using a pocket card brochure than a larger variant of the same. It is also the case that a pocket card brochure will be as effective since no content will be compromised.

Informed of Welfare Officer Care	Apply to Welfare Officer Care
By serving doctor	Phone call time booking
Pocket card brochure	Online form application on hospital online platform with BankID
Get introduced to Self-Care	Contact with Welfare Officer / Follow-up
Information on hospital online platform	Digi-physically with own platform
Pocket card brochure	
Self-Care	
Educated by welfare officer	
Own interactive platform	

Figure 19. The final chosen concept.

When the final concept is set into the *Function Diagram* seen in Figure 3 it shows on a conceptual level how the process for patients at SkaS will look like. The process is seen in Figure 20.



Figure 20. The final concept integrated into the function diagram.

3.7 Prototyping and further development

Due to limitations of time, the interactive platform will not be programmed but only built as a visual prototype. The visual prototype will in its turn not be fully built, also due to time limitations. However, the skeleton of the platform will be presented along with a recommended layout and explanations of those functions that each visual prototype will enable if realized in the future.

Furthermore, the pocket card brochure prototype and an action plan for SkaS to move from their current situation to the final concept seen in Figure 20 will be presented.

3.7.1 The own platform

The own interactive platform that is referred to in the final chosen concept, Figure 19, will not be programmed during this project. However, a visual prototype of it will be presented in this

sub-section. The own platform was decided to be visually displayed as a phone application by the project group at SkaS.

3.7.2 Platform function log to the prototype of the platform

From the *Target Specification*, a selection of needs for the interactive platform was created and collected in a log for the prototype construction. The platform function log contains all the demands seen in Table 10 connected to the interactive platform, a lot of wished needs, but also some add-ons to give the prototype a good costume to be presented in. These add-ons are the *Welcome page* and the *App overview page*.

This log is seen in Figure 21 and constitutes the ground on which the platform will be displayed as a prototype.



Figure 21. The platform function log presents what functions that will be displayed in the prototype for the project.

3.7.3 Prototype of the platform

The prototype of the platform is a visual prototype with the purpose of giving SkaS something to compare their future work to, as well as something to present to get further going in their digitalization process. The prototype is not a functional programmed app, only a visual concept of how this project is recommending the future app to look like. Everything in the visual prototype, including most choices of words and colors, is directly chosen to match the needs collected in Appendix A – *Stakeholder's Needs List*. In section 3.7.3 Prototype of the platform, the prototype will be presented in deeper detail.

Schematic view of the navigation in the phone app

In Figure 22 a navigation overview of the phone app is presented. The point of the navigation overview is for the reader to get an overview of how the different phone app pages are linked together. Different colored boxes represent different paths able to take with the phone app.



Figure 22. Navigational overview of the visual prototype. Different colored boxes represent different paths in the phone app.

The basic interface of the phone app

The basic interface of the prototype is built up to be simple and clean. It is also designed to not be too different from the existing Swedish health care site *1177 Vårdguiden*. The basic interface is seen in Figure 23.



Figure 23. The basic interface of the visual platform prototype.

At the top and bottom of the prototype, there are red rectangles. These rectangles are colored in a specific red to match 1177 Vårdguiden's colors. Up in the left corner, the logo of Västra Götalandsregionen is seen followed by the name Skaraborgs SkaS Skövde to show which hospital that the user is connected to. Since SkaS contains three more hospitals, Falköping, Lidköping, and Mariestad, the text could potentially be changed with respect to which hospital the user is logged into. The small white text at the bottom is only showing who has developed the prototype and is not a part of a potential fully developed phone application.

The visual prototype is also made in Swedish, that is because the project is aimed towards a Swedish hospital group and that they will benefit more from it if it is their mother tongue. Furthermore, some of the words used in the prototype are specifically used to suit the wishes of the stakeholders and thus hard to translate into English properly.

The Welcome page

The welcome page seen in Figure 24 is the first page you will see when opening the app for the first time. There are two options provided when at this page, to apply to the welfare officer care, or to look around the app by yourself. Information on what to do on this page is provided

in the text box. Lastly, the word *Friskvårdsapp* (*Wellness app*) is used instead of *Vårdapp* (*Care app*). The idea of that choice of word is based on the wish from Appendix A – *Stakeholder's Needs List* to use encouraging language.



Figure 24. The Welcome page, the first thing you see when entering the phone application for the first time.

The Overview

The Overview (Översikt) page in the app is seen in Figure 25 and is a navigational page that could navigate you to different features in the app. From here you can go to the Application to the welfare officer care (Ansökan om kuratorstöd), Healthcare overview (Vårdöversikt), the Self-care overview (Egenvårdsöversikt), the Latest news page (Senaste uppdateringarna), and the Feedback page.



Figure 25. The Overview of the app, a navigational overview of the features in the app.

The choice of having the *Application to welfare officer care (Ansökan om kuratorstöd)* at the top is because that is the most important service that SkaS can provide their patients according to the weighting of the functions seen in Figure 16 when removing the *Get informed of welfare officer care*, which the patient obviously already is when using the app, and the *Contact with welfare officer*, which is what the application leads to.

The Application step 1

The first step of the *Application to welfare officer care (Ansökan om kuratorstöd)* provides the user with general information about welfare officer care. What a welfare officer does, what happens during the meeting with a welfare officer, and what happens after the meeting.



Figure 26. The first step in the application to welfare officer care. General information of welfare officer care.

After reading the general information, a move-on button is provided. A *Go back (Gå tillbaka)* button is seen in the left-down corner to make sure that the user can cancel the application if wanted.

The Application step 2

In the second step of the *Application to welfare officer care* (*Ansökan om kuratorstöd*), information about what types of support the user can ask for from the welfare officer care.



Figure 27. The second step when applying to welfare officer care. Choice of errand.

The different types of support that can be asked for are emotional support, practical support, informative support, economical support, sexological guidance, and domestic violence. To get an explanation of what the different supports mean, the red arrow to the right of the text can be pressed, extending the page as seen in Figure 28.



Figure 28. The second step of the application to welfare officer care. An example of extending one of the supports that can be asked for.

For the area *Economical support (Ekonomiskt stöd)*, a short explanation is provided as well as the choice to see a video on the subject. Similar features are supposed to be provided for all the different supports but with different content. The idea is also that the support areas can be changed depending on the current supply of supports SkaS can deliver at the time.

Lastly, a *Move on* (*Gå vidare*) button is presented at the bottom to take the user to the third and final step of the application, and a *Go back* (*Gå tillbaka*) button, if the user wants to go back to step one.

The Application step 3

Step three of the *Application to the welfare officer care (Ansökan om kuratorstöd)* is seen in Figure 29 and provides the choice of how the user wants to be contacted, or contact the welfare officer care department.



Figure 29. The third step of the application to the welfare officer care. Choice of contact response on the application.

The different choices that can be made are to have a digital meeting, a physical meeting, to be called by a welfare officer, or to call during the time that the welfare officer care department is open for phone calls.

When the choice is done, there is a send-in button at the bottom of the page. Lastly, there is a *Go back* (Gå *tillbaka*) button if the user wants to go back to step 2.

The Health Care Overview

In Figure 30 the *Health care overview* (*Vårdöversikt*) is seen. The point of this page is to get an overview of the features that are connected to the health care treatment of the user, no matter what the treatment is. This includes treatment for chronic diseases, routine visits at SkaS, meeting with welfare officer, etc. In the figure, five explicit navigational choices can be made, *Treatment overview* (*Behandlingsöversikt*), *E-journal, Meeting planner* (*Mötesplaneraren*), *Messages to/from SkaS* (*Meddelanden till SkaS*), and a *Fill in forms* page (*Fyll i formulär*). The *Health care overview* (*Vårdöversikt*) page also provides a clear and visible box where the patient's next meeting with SkaS will be, no matter to who the patient will talk to.

V	Skarab	oorgs Sju	khus Skövde
Vårdöv	versikt		
	Näs	sta vårdn	nöte:
	Or	nsdag 25 a	pril
	Kurator:	Exempel Ex	empelsson
Г	В	ehandlingsöver	sikt
	E-journal		Mötesplaneraren
Mec	ddelanden till S	SkaS	Fyll i formulär
	Gå tillba	ıka	

Figure 30. The health care overview. Navigational overview of features connected to the health care treatment.

The *Treatment overview* (*Behandlingsöversikt*) page is supposed to show information related to long-term treatment, like one for a patient suffering from rheumatic disease. Progress and plan for treatment will be shown there, as well as potential choices in the treatment the patient has and can do/done. The length and history of the treatment will also be shown. It will also be possible to see all scheduled meetings, and other potential sufficient and important data about the treatment will also be shown.

E-journal is a function already existing in Sweden, but from Appendix A – *Stakeholder's Needs List* it is made clear that this is something that is wanted in a platform like this as well. The *E-journal* is a place where you, as a patient, can see everything that has been written in your journal, making it more clear to you what has actually happened and what is investigated in your treatment, and about your health.

The *Meeting planner (Mötesplaneraren)* is a function of the platform in which the patient and SkaS together can plan the coming meeting. The patient can provide information about what

he/she wants SkaS to deliver and talk about during the meeting and vice versa. This function makes it easier for both patients, but also SkaS, to come prepared to the meeting and to make the meeting more effective since the meeting is planned by both parties.

Messages to/from SkaS (Meddelanden till SkaS) is simply a function where the user can see messages from SkaS and reply or write a new message back. The idea of having a separate function in the app for messages to/from SkaS is to make sure that SkaS can adapt the function customed to their secrecy policies and rules.

Fill-in forms (Fyll i formular) is a page mainly requested from SkaS. It offers the possibility to fill in forms on beforehand that patients would have filled in anyway, but somewhere else. The wish of this feature is that there will be saving of valuable time and to keep everything under one roof, which in this case is the app.

Like most pages in the app, this one also has a *Go back (Gå tillbaka)* button to make the navigation in the app easier for the user.

The Self-Care Overview

The *Self-care overview* (*Egenvårdsöversikt*) is a navigational overview that provides the user with the options to use five functions, as well as to see how the progress towards an own set goal is going. The goal which is next in line will be named beneath the bar, and the bar visualizes how far the user has come towards the goal. The five other functions that the user can navigate to are, *My goals and progress* (*Mina mål och framsteg*), *Library* (*Bibliotek*), *My Schedule* (*Mitt Schema*), *My notes* (*Mina anteckningar*), and *Upcoming activities* (*Kommande aktiviteter*). The *Self-care overview* (*Egenvårdsöversikt*) is seen in Figure 31.



Figure 31. The Self-care overview page. A navigational overview of the features connected to self-care.

My goals and progress (Mina mål och framsteg) will in its turn provide the functions for the user to create personal goals and sub-goals. Furthermore, there will be possible to create an action plan for the user's goals and sub-goals.

The *Library* (*Bibliotek*) will contain information. Information that will be held in the library will be videos, literature recommendations, studies, and self-treatment manuals. There will be a search and filter function to ease the search for the user.

My schedule (Mitt schema) is a page where the upcoming meetings with SkaS, booked activities, and whatever the user wants to plan, will be seen. This is a calendar function. The calendar function will also enable an alarm function so that the user will not have to memorize when to do the planned things.

My notes (Mina anteckningar) is a function where the user can note down whatever he/she finds noteworthy. It was originally a diary function but will not be restricted to that activity.

Upcoming activities (Kommande aktiviteter) will enable the user to see the coming planned group or single activities for different patient groups. Ideally, it will be possible to see both

activities that SkaS and other actors have planned. The user can then book to participate in these activities.

As a standard function, the Go back (Gå tillbaka) button is also a part of this page.

Latest updates page

The *Latest updates (Senaste uppdateringarna)* page, seen in Figure 32, was wished by the patients so that it would be easier to get information about new functions in the app. This page will therefore be a list of all the recent functions, and other content the latest update provided, like bug fixes or interface changes.



Figure 32. The updates page. Shows the latest updates on the app.

Feedback page

The *Feedback* page, seen in Figure 33, is a place where the user gets the function to provide SkaS information about what they like and dislike about the app. This is an important function for SkaS since it keeps them updated on what they need to do, or not do, to keep the users satisfied.

Skaraborgs Sjukhus Skövde
Ge oss feedback
Hur upplever du appen?
+
Vad skulle du önska finns med
i nästa version av appen?
Skicka in feedback
Gå tillbaka

Figure 33. The feedback page is where the patients can provide information on how their experience with the app is.

The *Feedback* page provides the functions to rate the overall experience of the app, with the emojis, to fill in what the user wishes to see in a future edition of the app, a button to send in the feedback, and a standard go back button. The wishes from the user on what should be in the future editions are filled in the boxes with text. The feedback page is kept simple to lower the doorstep for filling in feedback.

3.7.4 The pocket card brochure prototype

In Figure 34, the pocket card brochure prototype is seen. According to Figure 20, the pocket card brochure should introduce the patient to welfare officer care and to self-care. These two functions are provided by information about the app and a selling and stripped description on what it can provide



Figure 34. The pocket card brochure prototype. Short selling information on what the phone app can provide for the patients.

In the lower-left corner of the pocket card brochure, a QR-code to where the patient can download the app is provided. However, the QR-code in the figure is an example QR-code and does not lead the scanner to a download site.

3.7.5 Action plan for the concept

Since the set time of this project will not allow for a final realization of the chosen concept and the phone app, an action plan in three steps was created to guide SkaS on the journey of realizing it. The action plan is seen in Figure 35.

11_1	
Informed of Welfare Officer Care	
By serving doctor	
Pocket card brochure 1	
Apply to wellare Officer Care	
Phone call time booking	
Online form application with BankID login	
Get introduced to Self-Care	
The Commention of the Comment of the	
information on verification page after application	
Pocket card brochure_1	
Contact with Welfare Officer / Follow-up	
Digi-physically with existing apps	
- 8 I	
G 16 G	
Self-Care	
Educated by welfare officer	
(Online) Brochure	
11.2	11.3
11_2 Informed of Welfore Officer Care	11_3 Informed of Welfere Officer Care
11_2 Informed of Welfare Officer Care	11_3
11_2 Informed of Welfare Officer Care	11_3 Informed of Welfare Officer Care
11_2 Informed of Welfare Officer Care By serving doctor	11_3 Informed of Welfare Officer Care By serving doctor
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3
	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3
	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care
	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on bosnital online platform with BankID
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID
	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2	
	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform Pocket card brochure_3 Contact with Welfare Officer / Follow-up
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2 Contact with Welfare Officer / Follow-up Digi-physically with existing apps	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform Pocket card brochure_3 Contact with Welfare Officer / Follow-up Digi-physically with own platform
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform Pocket card brochure_3 Contact with Welfare Officer / Follow-up Digi-physically with own platform
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11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2 Contact with Welfare Officer / Follow-up Digi-physically with existing apps Self-Care	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform Pocket card brochure_3 Contact with Welfare Officer / Follow-up Digi-physically with own platform
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	11_3 Informed of Welfare Officer Care By serving doctor Pocket card brochure_3 Apply to Welfare Officer Care Phone call time booking Online form application on hospital online platform with BankID Get introduced to Self-Care Information on hospital online platform verification page after application Information on hospital online platform Pocket card brochure_3 Contact with Welfare Officer / Follow-up Digi-physically with own platform Educated by welfare officer
11_2 Informed of Welfare Officer Care By serving doctor Pocket card brochure_2 Apply to Welfare Officer Care Phone call time booking Online form application with BankID login Get introduced to Self-Care Information on verification page after application Pocket card brochure_2 Logi-physically with existing apps Self-Care Educated by welfare officer (Online) Brochure with interactive features	

Figure 35. Action plan to achieve the final chosen concept in three steps.

The three steps are named 11_1, 11_2, and 11_3 and refer to the fact that the final chosen concept is a refined and combined concept which in number order was the 11th concept built. The goal of the action plan is to help SkaS provide the phone app presented in section 3.7.3 Prototype of the platform.

The first step is supposed to be able to implement very soon after the end of the master's thesis by realizing a pocket card brochure, an online form application with BankID log in, and setting up an online brochure for basic self-care to the patients. The online brochure should also be created in such a way that it could be printed out as a physical copy to give to patients that for any reason will not use the digital services. The content of the self-care brochure will be decided by SkaS with their expert knowledge on what is most effective.

The second step takes a step towards the phone app by adding some interactive features to the online brochure which provides self-care, and if needed, also update the pocket card brochure. What interactive features that are included in the second step are not decided and are left to the expert knowledge of the subject that SkaS has. However, a recommendation is to start developing a goals and sub-goals section so that patients can easily get started on their individualized goals even before the phone app is launched.

The third step is where the full transformation to the phone app takes place. The platform is built during steps one and two, but not made available to the patients until step three. The application function and the external self-care brochure that is provided to the patients during steps one and two will be integrated into the phone app along with the other functions presented in section 3.7.3 Prototype of the platform. This step will take the most time to implement and that is why steps one and two are formed to enable the most important functions of the process.

With the action plan handed to SkaS, the development towards a future with digi-physical welfare officer care services can be done side by side with a few short-term implemented actions that benefit the patients even before the phone app is launched.

3.8 Verification of Concept and Prototypes

In Figure 36, the prototype evaluation result is seen. The evaluation is done comparing to the demands stated in Appendix C – *Target Specification*. Figure 36 tells us what metric is being analyzed and what need it connects to. The need number can be used to track down what need it is measuring in Appendix A – *Stakeholder's Needs List* and the metric number tells us in which order the metric is written in Appendix B – *List of Metrics*. The D/W column tells us whether the measured need is a demand or wish, and in this evaluation, only demands are being analyzed, hence only Ds (Demands). The next column is the approved column, it shows us whether the prototypes or concept fulfills the demand or not. A box marked with X means it is approved. Location of approval column shows where in the prototypes or concept the need is being fulfilled. The enables potential approvement column is a column that is marked with an X if the prototypes and concepts could enable the demand but for some reason cannot be approved during the evaluation. Lastly, the comments column is a column where short information is put if something needs to be clarified.

Metric						Enables potential	
No.	Need Nos.	Metric	D/W	Approved	Location of approval	approvement	Comment
1	1	Have a booking system for both first time appointment and follow-up meeting	D	х	Phone app, Application		
2	2	Have an errand application function	D	Х	Phone app, Application		
7	7	Enable message service	D	х	Phone app, Health Care Overview - Messages to SkaS		
28	28	Enable work with personal goals	D	х	Phone app, Self-Care Overview - My Goals and Progress		
35	35	Enable to switch between digital and analog treatment during treatment time	D	х	Function Diagram, Before every meeting		
39	39	Enable intact overview of patient well being for the hospital	D			х	More information is needed to evaluate.
		[Enable data gathering for patient]					
55	53	Owner of the data must be trustworthy	D	Х	-		SkaS is a trustworthy data owner.
		[Enable patient to get motivated in his/her self-care]					
58	56	Provide a fast introduction to mental self-care after chronical diagnose	D	х	Function Diagram, Pocket Card Brochure		
61	59	Enable easy access self-care tools	D	х	Phone app, Self-Care Overview - Library		
71	69	Provide quality assured information	D	х	-		SkaS is resposnible for this and reliable to do so.
72	70	Provide regular updates of information	D	х	-		Dependent on SkaS routines, but they are trusted to do so.
74	72	Provide information about professions externally	D	X	Phone app, Application		
86	84	Provide information on how to do some "easy things" yourself that welfare officers provide today	D	х	Phone app, Self-Care Overview - Library		
91	88	Use an easy and intuitive interface with evident icons	D			X	More evaluation needs to be done.
92	89	Enable integrability to already existing platforms	D			х	Dependent on how and where SkaS decide to develop the phone app.
102	99	Enable physical tests and evaluations	D	х	-		Fulfilled by direct cause of Need No. 35 being fulfilled.
103	100	Enable good alliance between patient and hospital	D			X	More evaluation needs to be done.

Figure 36. Prototype evaluation on demands from Target Specification.

In Figure 36, two of the rows are marked with a dark grey color, which means that the need will not be evaluated. In this case, both needs in the dark grey rows are secondary needs but only stated as wishes and they are written in the evaluation since a tertiary need beneath them is a demand. The tertiary need is, however, evaluated even though the secondary is not.

From the evaluation 13 out of 17 demands are being approved directly while 4 of 17 are not. However, the four non-approved demands are, all of them, qualified to be approved with the concepts and prototypes. The reason for not approving them will be discussed.

The first demand to not be directly approved is need 39, *Enable intact overview of patient wellbeing for hospital*, meaning that SkaS will be able to get a sense of the wellbeing of their patients. To find out whether the prototypes and concepts are fulfilling this demand, we must evaluate more. As stated in the comment column, more information is needed. In this case, the demand must be evaluated over a period of time and can thus not be directly approved. However, the concepts and prototypes enable the demand to be approved since the communication between welfare officer and patient will not be taken away and the concepts and prototypes will enable more statistics and evaluation material for the welfare officer to go through when evaluating the wellbeing of the patient.

Secondly, the demand *Use an easy and intuitive interface with evident icons* is not directly approved. More extent evaluation with input from users needs to be collected to identify if the demand is fulfilled or not. From personal discussions within the project group, it has come to attention that the demand is fulfilled with regard to their opinion. However, that is an insufficient amount of input to draw any conclusions on and also too small degree of users involved, but it points in the direction of potential fulfillment, hence the X in the potential approvement box.

Enable integrability to already existing platforms is not directly approved since no functional prototype has been built. If the demand will be fulfilled or not is up to SkaS when developing the concepts and prototypes further, it is, however, doable hence the X is the potential approval box.

The last demand to not be directly approved is the *Enable good alliance between patient and hospital* which basically means to have a good relation between them. It is not directly approved since there is no way of measuring this without evaluating it over a period of time and then evaluate with both patients and welfare officers. However, this is something that might be evaluated with the feedback page in the own platform.

The box of potential approval is checked with the argument that the concepts and prototypes do not remove any physical or traditional ways of using the welfare officer care automatically. The services are still intact, but they are broadened and slightly moved to a digital environment.

If all four non-direct-approved demands are being approved after evaluation in the future, all demands are fulfilled.

4. Discussion

In the Discussion chapter, the research questions will be answered. Furthermore, the relevance of the project, findings, and societal, ethical, and ecological considerations will be presented.

4.1 Answer to the research questions

In answer to the research questions, the research questions of the thesis will be presented and answered explicitly and concisely.

What are the needs of the welfare officer care stakeholders for its future services?

The first research question to be answered is what the needs of the welfare officer care stakeholders for its future services are. These needs are listed in Appendix A – *Stakeholder's Needs List* but the main needs that were found during the project can be summarized as follows:

To Increase availability of the Welfare officer care To Enable patient control of treatment To Provide excellent self-care To Provide excellent information availability To Enable user-friendly digital parts To Enable digi-physical meetings To Improve healthcare

How can the digi-physical process of the welfare officer care services be designed to satisfy the stakeholders' needs?

The second research questioned to be answered is how the digi-physical process of the welfare officer care services can be designed to satisfy the stakeholder's needs. In Figure 20, the chosen concept integrated into the *Function Diagram* is presented. The answer to the question is thereby answered by that figure. However, the reason it is answered is that the means to solve the functions in the *Function Diagram* are based on the main needs presented in Table 8 labeled *Primary needs*. Below, the primary needs will be presented and explained how the *Function Diagram* with integrated final concept solves the need.

To Increase the availability of the welfare officer care. By including every newly chronic disease diagnosed patient to follow the *Function Diagrams* path, the availability of the welfare officer care is broadened from today's state since the current situation does not necessarily include all newly chronic disease diagnosed patients. Furthermore, the function and mean to apply to the welfare officer care, via a phone application, is also a new and more available way of getting in contact with welfare officer care since it can be done by each patient alone.

To Enable patient control of treatment. This need is fulfilled since the patients will get options on how they contact or get contacted by the welfare officer care after applying to receive their services. It is also the case that the patient control is enhanced thanks to the focus on self-care, which is a way of treating the patient where the patient is the commander of it. Thereby the control is not only enabled but also increased.

To Provide excellent self-care. The self-care that the welfare officer care department at SkaS will provide their patients is not designed yet. However, as a regional hospital SkaS is inclined to only deliver evidence-based self-care tools and their credibility to do so is high.

To Provide excellent information availability. This need is fulfilled by the phone app that is designed in the thesis. The function *Library* is designed to be of utility in the direction of information availability. Of course, again, the information that will be provided in the *Library* is decided by SkaS, and as stated already, their credibility to do so is high.

To Enable user-friendly digital parts. The phone application is designed in a way that should be intuitive and easy to understand. There are no unnecessary visual features or weirdly named functions. The need is thereby met. However, there is a utility to explore this further.

To Enable digi-physical meetings. The process enables digi-physical meetings by stating that digital meetings will be available and by stating that the physical meetings will not be removed as the digital meetings get introduced to a higher extent.

To Improve healthcare. By improving the welfare officer care the result that follows is that the overall healthcare is improved. However, there are more specifically expressed needs of what parts of the healthcare that the stakeholders of the welfare officer care want to be improved. However, this thesis scope is not explicitly touching those areas.

What are the main digital functions of the digi-physical services?

The main digital functions of the digi-physical services are the function of having video meetings and the phone application. In the phone application, the main digital functions are the application to welfare officer care and the self-care areas.

What future actions could be taken to realize the purpose laid out in section 1.5 Purpose and research questions.

The future work recommendations to SkaS are more detailed outlined in chapter 6. Future work. However, the recommendations will guide SkaS in a direction that follows the work of the thesis. Some of the recommendations are based and follow-up projects on the outcome of the thesis while some are new projects that the thesis performer view as beneficial to SkaS' welfare officer care department. The recommendations are as follows:

Further develop the mobile phone app into a downloadable and working app

Look into how the welfare officers' work process can be more standardized

Further develop the self-care

A great need for societal education on digital tools

Research on what vital digital tools and applications are

Make the patient data of the welfare officer care more effective

4.2 The relevance of the project

Taking a look at Appendix A – *Stakeholder's Needs List*, the *Stakeholder's Needs List* the number of expressed needs are significantly pointing towards the relevance of this project and certainly future, more concretized projects on the same track. However, when looking at many of the expressed needs, many of them are solved already through other channels, such as 1177

Vårdguiden and *Närhälsan online*, which are provided by health care. The relevance of the solutions proposed in this master's thesis could, therefore, to some extent, be questioned.

There are some different ways of arguing for the relevance of this project. First off, this master's thesis was asked for on the behalf of SkaS, which ultimately means that there, at least from their point of view, is something within this area of research that they find of interest and importance. This argument was even more strengthened by the fact that an internal project group together with the thesis performer was set up, rapidly, with great care and competent people. Combined with that, there are no specific or directly adapted digital services for the welfare officer care as of today, which subtly implies that the welfare officer care is, to some degree, neglected of resources, hence in need of development of their current services and processes. This is also part of the reason why the project is mainly focusing on the welfare officer care.

Secondly, the development team at SkaS has together with the welfare officer care department discussed and to some degree also designed components for solutions in the direction of this project. Therefore, from their point of view, this project has also been a verification on an early stage, to see whether they are going in the right direction with their ideas or not. There are however no official existing components for solutions before this project.

Thirdly, the outcome of this project also points out one important thing about the marketing of the existing services provided by SkaS, and the health care services as a whole in *Västra Götalandsregionen*, that the marketing has not reached out to a majority of patients. Why this is could be discussed but will not be here. However, if it must be taken down to its smallest significance, this project could at least be used as a hint that more effort needs to be done when it comes to marketing the existing digital services at SkaS.

Fourthly, as seen in Appendix A – *Stakeholder's Needs List*, there is a wish from the patients to keep all the digital solutions at the same place and also to keep it intuitive. Whether this project should have had taken off from the already existing solutions, like 1177 Vårdguiden and Närhälsan online, or, as it was, been a general development project could also be discussed and partly argued for in the second argument here. But the report will keep it at that and just ascertain that the provided final delivery of this master's thesis meets the wish of keeping the services at the same place in a more satisfying way than current solutions does.

Lastly, the need for more self-care information and tools is one of the most commonly expressed needs of the entire *Stakeholder's Needs List*, which without a doubt points out that there is an unmet need for these tools and information. Another proof of this is the growing amount of self-care apps for mobile telephones that are arising. The final delivery of this project puts great weight into the self-care part and has strong support from the interviews carried out, on what is needed and required from the patients as well as the employees of SkaS when it comes to self-care.

4.3 Findings

The findings section will be pointing out some potentially important findings of this project that is not presented in chapter 3. Results.

An implicated good health care quality

When comparing the different results of the primary needs in Appendix A – *Stakeholder's Needs List* we can see that there are relatively few needs and in the category *Improvement of*

healthcare. The importance of the secondary and tertiary needs listed within that primary need is also of relatively low value. The numbers combined with the thesis performer's perception of the interviewed patients but also employees implies that the quality of the overall treatment that the interviewees of this project take part in are at least good enough to not comment, to a large extent, about.

Development in a right direction

The fact that there are multiple needs expressed during the interviews and some of frequent occurrences that overlap with services that are already provided today implies that the development within SkaS is going in the right direction. As stated in section 4.1 Answer to the research questions

to the research questions In answer to the research questions, the research questions of the thesis will be presented and answered explicitly and concisely.

What are the needs of the welfare officer care stakeholders for its future services?

The first research question to be answered is what the needs of the welfare officer care stakeholders for its future services are. These needs are listed in Appendix A – *Stakeholder's Needs List* but the main needs that were found during the project can be summarized as follows:

To Increase availability of the Welfare officer care To Enable patient control of treatment To Provide excellent self-care To Provide excellent information availability To Enable user-friendly digital parts To Enable digi-physical meetings To Improve healthcare

How can the digi-physical process of the welfare officer care services be designed to satisfy the stakeholders' needs?

The second research questioned to be answered is how the digi-physical process of the welfare officer care services can be designed to satisfy the stakeholder's needs. In Figure 20, the chosen concept integrated into the *Function Diagram* is presented. The answer to the question is thereby answered by that figure. However, the reason it is answered is that the means to solve the functions in the *Function Diagram* are based on the main needs presented in Table 8 labeled *Primary needs*. Below, the primary needs will be presented and explained how the *Function Diagram* with integrated final concept solves the need.

To Increase the availability of the welfare officer care. By including every newly chronic disease diagnosed patient to follow the *Function Diagrams* path, the availability of the welfare officer care is broadened from today's state since the current situation does not necessarily include all newly chronic disease diagnosed patients. Furthermore, the function and mean to apply to the welfare officer care, via a phone application, is also a new and more available way of getting in contact with welfare officer care since it can be done by each patient alone.

To Enable patient control of treatment. This need is fulfilled since the patients will get options on how they contact or get contacted by the welfare officer care after applying to receive their

services. It is also the case that the patient control is enhanced thanks to the focus on self-care, which is a way of treating the patient where the patient is the commander of it. Thereby the control is not only enabled but also increased.

To Provide excellent self-care. The self-care that the welfare officer care department at SkaS will provide their patients is not designed yet. However, as a regional hospital SkaS is inclined to only deliver evidence-based self-care tools and their credibility to do so is high.

To Provide excellent information availability. This need is fulfilled by the phone app that is designed in the thesis. The function *Library* is designed to be of utility in the direction of information availability. Of course, again, the information that will be provided in the *Library* is decided by SkaS, and as stated already, their credibility to do so is high.

To Enable user-friendly digital parts. The phone application is designed in a way that should be intuitive and easy to understand. There are no unnecessary visual features or weirdly named functions. The need is thereby met. However, there is a utility to explore this further.

To Enable digi-physical meetings. The process enables digi-physical meetings by stating that digital meetings will be available and by stating that the physical meetings will not be removed as the digital meetings get introduced to a higher extent.

To Improve healthcare. By improving the welfare officer care the result that follows is that the overall healthcare is improved. However, there are more specifically expressed needs of what parts of the healthcare that the stakeholders of the welfare officer care want to be improved. However, this thesis scope is not explicitly touching those areas.

What are the main digital functions of the digi-physical services?

The main digital functions of the digi-physical services are the function of having video meetings and the phone application. In the phone application, the main digital functions are the application to welfare officer care and the self-care areas.

What future actions could be taken to realize the purpose laid out in section 1.5 Purpose and research questions.

The future work recommendations to SkaS are more detailed outlined in chapter 6. Future work. However, the recommendations will guide SkaS in a direction that follows the work of the thesis. Some of the recommendations are based and follow-up projects on the outcome of the thesis while some are new projects that the thesis performer view as beneficial to SkaS' welfare officer care department. The recommendations are as follows:

Further develop the mobile phone app into a downloadable and working app

Look into how the welfare officers' work process can be more standardized

Further develop the self-care

A great need for societal education on digital tools

Research on what vital digital tools and applications are

Make the patient data of the welfare officer care more effective

4.2 The relevance of the project could also point towards failures in the marketing of these services.

A general great need of development

Both patients and employees that have been interviewed in this project have been committed to the project more than what was predicted. This is backed by numbers when comparing planned interviews with actual interviews and when looking at the length of the interviews which in many cases exceeded 40 minutes. This could imply that the hunger for development within health care is large and this is something that should be capitalized on the behalf of SkaS to accelerate the development. The results also could imply that there is a great need for general development in line with the societal trend of customizing services and products.

A good drive in patients

The large amount and frequent occurrence of self-care-related needs talks for the point that there is a good drive within a lot of patients that is unused. In the future, considering the bad forecast of an increase of the resources used for health care, this could be a key factor to capitalize on in the direction of increasing patients' wellbeing. According to Angus Deaton in the book *The Great Escape*, the habits of people, which actively engaging in self-care, is also one of the key factors in extending the wellbeing and length of life (Deaton, 2019).

An easier way of collecting patient data

From the project's group meetings, it has been discussed shallowly on the patient data of the welfare officer care department. It has come to attention that even though a lot of patient data is indeed noted down, it is very hard to navigate through it and to know exactly what means what. With help of an own developed platform, like the one this project suggests, at least some patient data will be easier to collect for practical purposes.

A potential great amount of time saved

Let's assume that one physical meeting within the welfare officer care takes roughly 40 minutes. These 40 minutes include the actual meeting, the preparation time, and the logistics with go getting the patient in the waiting room, walk back together, let the patient take off their jacket, and then finding a comfortable position in the room. Let's estimate that the time to do these logistics and to get comfortable takes eight minutes.

If the meeting would have been digital, these preparations would have been done before the meeting, so that the meeting could start at the appointed time. It, with our assumed numbers, means that the meeting is shortened down to 32 minutes, including preparations. In other words, this means that for every fourth meeting the welfare officers have digitally, they will have saved time matching another digital meeting. To add up to another physical meeting they would need five digital meetings.

Obviously, the magnitude of the time saving discussed from these assumed numbers depends on how big the patient flow to the welfare officer care is. However, eight minutes of a 40 minutes long meeting is 20% of the time and is certainly a significant amount of time. Of course, there is no way to know the magnitude on beforehand and this theoretical example could have assumed totally wrong numbers but if we assume that a meeting is 60 minutes instead of 40, eight minutes out of that would still be a significant percentage, roughly 13%.

Now of course this would be something to investigate in the future. However, since a standard meeting with a patient within the welfare officer care is really hard to define, it will certainly first be needed to find a good method for evaluating data when it comes to efficiency in the

welfare officer care. With that said, both things would in my opinion be of great value to investigate for SkaS.

4.4 Societal, Ethical and Ecological aspects

This master thesis was executed by SkaS, which is part of the Welfare system and thus very relevant when considering the societal aspects of the thesis. Everything that benefits healthcare will in its turn benefit society's well-being. This project was part of a plan to make sure that as many people as possible get the best treatment as they can get. Thanks to that, more and more treatment programs have started to include Welfare officer care services, which, in turn, lengthens the queues to named department and it is due to that reason this project gets very relevant.

Another societal aspect of this thesis is that since it was executed by SkaS it was, to the small extent it needed, using the taxpayers' money to make sure it was possible. With that in mind, this project is put in the box of things that should be taken upon with great seriousness so that the political trust in the region is not jeopardized due to beliefs that SkaS is putting money on projects that do not lead to anything worth of pursuing.

Lastly, this project is very interesting from a collective knowledge perspective since the collaboration is between SkaS and Chalmers. By joining the technological and systematic ways of working from Chalmers part and applying it on the healthcare part there is a lot of knowledge coming together and hopefully, that will bring out synergies that could be of great benefit for all.

When considering the ethical aspects of this thesis the handling of private people's personal data is relevant. Since the project was dependent on input from patients at SkaS it arose some secrecy protocols to work along with. Also, to be able to guarantee the participants' anonymity there needed to be solutions on how to manage them. However, SkaS has protocols for this that were applied in the project.

The ecological aspects of this project are pretty small, but since the project is of digitalization nature, one could, farfetched, draw the parallel to digitalization decreasing traveling to and from SkaS and with today's measure then reduces the amount of fossil fuels used.

5. Conclusion

The purpose of the thesis was to help SkaS develop their existing services for patients that are or will be subscribed to welfare officer care to meet a growing need for welfare officer care at SkaS. The purpose was met by focusing on developing the services to be digi-physical since SkaS wants to make progress in that direction. From this master's thesis the main deliveries were:

The *Stakeholder's Needs List* for the development of digi-physical services since SkaS could ground their future projects related to digi-physical services in a solid stakeholder's needs research.

The chosen concept integrated into the *Function Diagram* of the digi-physical services planned to be supplied. This *Function Diagram* gives a recommendation on how a patient perspective of SkaS services will be and how to provide all demanded needs expressed during the extensive input gathering done during the thesis.

The visual concept prototype of a phone app constructed based on the *Stakeholder's Needs List*. This delivery can function as a guide when developing the digi-physical services at SkaS on a concretized level since it is grounded in the stakeholders' needs. The visual concept prototype can also be used from SkaS part as a template if deciding to develop a phone app as part of their services.

The action plan to start working in the direction this master's thesis points out. The point of the action plan is to map out a way SkaS can deliver value to the patients shortly after this project without having the complete concept in place to implement. Many important and requested features can be delivered from SkaS without the entire concept ready. On top of that, the action plan is constructed in a way that makes sure no valuable functions delivered early in the plan are lost when taking the final step towards digi-physical implementation. All value added in the beginning is transferable to the last step of the action plan.

From the deliveries of this master's thesis, all stated research questions of this thesis have been answered and the hope is that SkaS can leap forward in their work for a digi-physical future where the availability of the welfare officer care supply meets the demand to a satisfying degree. Furthermore, is the hope that the extensive stakeholder's needs research, that would have been a time consuming project for SkaS without external help, can benefit future projects within SkaS and other welfare officer care institutions in Sweden and globally when facing the growing societal demand of named care.

As for the last of this master's thesis, I would advise SkaS to take advantage of the deliveries from this thesis as well as from other similar projects and keep the work going in the direction of supplying first-class welfare officer care by starting more research and development projects.

6. Future work

In the future work chapter, the thesis performer lays out future work opportunities.

Further develop the mobile phone app into a downloadable and working app

The first recommendation from this master's thesis would be to finish the mobile phone app. It is well-grounded in the stakeholders' needs and is a good step to take to get forward from where this thesis leaves. The next step in the development of the app would be to map out more in detail than this thesis does, exactly what functions will be in it. Then when the template that this thesis leaves behind is filled to a satisfying degree the next step would be to start programming the app.

Look into how the welfare officers' work process can be more standardized

From the interviews of this project and when talking to welfare officers beside the project, the feeling of a need for standardization arises. This is well seen in this thesis since there is a large quest for clearance in what a welfare officer does, but that seems to be grounded in a large spread of what welfare officers do. The different approaches different welfare officers have towards their tasks seem to be of such width that a standardization seems to be necessary to make the welfare officer care more effective and clearer to potential users of it.

Further develop the self-care

The deliveries this thesis hands over to SkaS points toward the direction of a society where self-care will have a larger role to play than today. It seems to me that the best focus area to satisfy as many patients as possible is self-care. By granting people tools to increase their wellbeing by themselves, in cases this is possible, seems both more time-efficient and resource-effective than to lead everyone through an already resource-stressed health care.

A great need for societal education on digital tools

To not leave people without knowledge on how to use digital tools behind when developing the welfare officer care, it is important that the state of the art is fit to as many as possible. This can be done by either adapting the processes and technologies to fit as many as possible or to educate as many as possible to be able to follow the development. I would therefore recommend more societal education of vital digital tools and applications.

Research on what vital digital tools and applications are

To be able to launch a widely spread education on vital digital tools and applications, research on what this is, needs to be done. It is, as with most things, very important to get the planning right so that the direction does not have to turn unbearably much when later trying to execute the development of the education plan.

Make the patient data of the welfare officer care more effective

From chapter 4.3 Findings, there seems to be a need of making the patient data of the welfare officer care at SkaS more effective. Developing a process and standard system for what type of data and when to note it down could be of great value to SkaS.

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Appendix A – Stakeholder's Needs List

The *Stakeholder's Needs List* contains 118 needs collected from 20 unique interviewees. The *Stakeholder's Needs List* provides information about the stakeholders' needs, the degree to which the need was expressed in the interviews, the importance of the need, and who the stakeholder of the need is. The number of primary needs listed in the *Stakeholder's Needs List* is seven with varying numbers of secondary and tertiary needs beneath them.

In the *Stakeholder's Needs List*, the primary needs are in the column *primary needs*, and the secondary and tertiary needs are in the column *needs*. However, the secondary needs are written in standard letters whereas the tertiary needs are italicized and slightly moved to the right.

Stakeholder																																													
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mportance	6,0	4,0	4,0	3,3	3,5	3,5	5,5	3,5	3,8	3,5	3,8	2,8	3,3	3,3	4,0	3,0	3,5	2,3	2,0	3,3	2,5	2,5	1,5	2,0	4,0	2,5	3,5	3,8	2,5	2,5	2,5	2,5	2,0	3,5	4,0	3,0	3,0	1,5	4,0						
Average importance _I from hospital	9	9	9	4,5	5	5	5	5	5,5	3	5,5	3,5	4,5	4,5	6	4	ŝ	2,5	2	4,5	ŝ	ŝ	1	2	6	6	33	3,5	3	ę	ŝ	ŝ	2	33	6	4	4	1	9						
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Needs	Have a booking system for both first time appointment and follow-up meeting	Have an errand application function	Different options for patient on how to get contacted	Fast completion	Provide contact info to healthcare	Enable direct contact with "your caregiver"	Enable message service	Provide verification of recieved message	Not to finish errand before patient feels done	Enable voice messages	Enable text messages	Enable file attachment	Fast response	Take advantage of phone technology	Promote existing digital services	Acute matters should be highlighted	Efficient sifting of patients with welfare officer care and those without	Establish welfare officer care contact with all patients diagnosed with a chronical illness	Fast welfare officer care contact after diagnosed with a chronical illness	SMS notification to inform patient of that welfare officer care could be provided	Enable patient-healthcare joint patient control over treatment	Enable overview of treatment, goals and progress	Enable renewal of prescriptions	Enable patient to reach journal	Notification when new information of current errand/treatment is available	Clarify treatment options	Provide patient-healthcare joint meeting planning	Enable work with personal goals	Enable goal and sub-goal planning	Enable creation and overview of action plan	Enable creation and overview of life planning	Enable progress overview	Enable calender function with notifications and alarm	More options and decision making for patient during treatment	Enable to switch between digital and analog treatment during treatment time	Enable easy patient communication between healthcare and welfare officer care	Provide evaluations and feedback of treatment to hospital	Enable informationsharing of patients between hospitals and child- grown up health care institutions of	Enable intact overview of patient well being for the hospital						
Primary needs										Increase availability of the Welfare officer	care																			Enable patient control of treatment															
No.	1	7	ю	4	5	9	7	8	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39						
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3 0	ý c	5.0	0.0	3.0	2.0	2.0	2.5	4,5	2.5	3,5	2.5	2,0	4,0	2,5	2,5	4,0	3,5	2,0	6,0	3,5	3,0	3,0	3,0	1,5	3,0	1,5	3,0	3,0	4,0	4,0	3,0	6,0	4,0	2,0	2,5	2,5	2,0	3,5	4,0	1,5	4,0	1,5	4,0	4,0	
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Devrida motions forum	I LUMAN paralle for the solution of anti-day and index	Endole coordination of Tendo activities Frankle ratients to find rehach activities	Fuble numers to find events of and events	Enable patients to find excercise groups	Enable patients to get in touch with people in same situation	Enable a platform to build up a "shareville operation"	Promote local patient organisations	Provide education, lectures, and events digitally or physically	Enable data gathering for patient	Enable form filling, patient-healthcare joint	Only enable patient to fill in relevant data	Enable regular diary and well being data gathering over time	Owner of the data must be trustworthy	Enable patient to get motivated in his/her self-care	Provide a satisfying amount of follow-up on self-care matters	Provide a fast introduction to mental self-care after chronical diagnose	Enable the self-care to connect to personal goals and sub-goals	Enable progress overview	Enable easy access self-care tools	Provide excercise videos	Provide excercise schedules	Provide nutrition schedules	Provide treatment manuals	Provide digital live excercise sessions	Provide feed of news, latest functions and add-ons	Enable data import from external applications	Enable data export to external applications	Enable calender function with notifications and alarm	Provide quality assured information	Provide regular updates of information	Provide information about professions internally	Provide information about professions externally	Provide information on what patients can expect of the hospital	Provide information on what the patient can demand of the hospital	Provide clear information on different illnesses	Provide clear information on different treatments	Provide information to other authorities, employers and institutions	Provide information to near related to different illnesses	Provide clear information about fertility- and sex-related issues on different illnesses	Provide a FAQ on different illnesses	Provide equivalent information to non-users of digital equipment	Provide education programs for hospital staff	Provide education programs for the most common used digital applications and tools	Provide information on how to do some "easy things" yourself that welfare officers provide today	
72														Provide excellent self-care																							ovide excellent information availability								
40	2 5	41	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	99	67	68	69	70	71	72	73	74	75	76	77 P.	78	79	80	81	82	83	84	

6 4,0 A,0 Patient	6 4,0 4,0 Patient	6 6,0 6,0 Patient, Hospital	6 6,0 6,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	3 2,5 2,0 Patient, Hospital	5 3,5 3,0 Hospital	3 2,5 2,0 Patient	3 2,5 2,0 Patient	6 4,0 4,0 Hospital	6 4,0 4,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	6 4,0 A,0 Patient	2 2,0 2,0 Patient, Hospital	6 5,0 5,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	3 2,5 2,0 Patient, Hospital	6 4,0 4,0 Patient	6 4,0 4,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	3 3,5 3,0 Patient, Hospital	4 3,0 Patient, Hospital	2 2,0 2,0 Patient	2 2,0 2,0 Patient	6 4,0 4,0 Patient	2 2,0 2,0 Patient	2 2,0 2,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	2 2,0 2,0 Hospital	4 3,0 3,0 Patient, Hospital	2 2,0 2,0 Patient, Hospital	6 4,0 4,0 Patient, Hospital	2 3,0 3,0 Patient, Hospital
1	1	3	3	-	1	-	1	-	1	-	1	1	1	2	1		1	-	1	2	1	1	1	1	1	-	1	1	1	1	1	2
Provide short and informative information	Provide information through video and text	Use an easy and intuitive interface with evident icons	Enable integrability to already existing platforms	Use few patient accounts	Low hardware requirements to use the digital services	Provide a fast digital support to hospital	Easy understandable evaluations with smileys or scales	Enable evaluations to have a textbox to clarify if wanted	T ransferable digi-physical concept to other departments	Enable screen sharing	Enable video meetings	Provide audio information	Enable physical tests and evaluations	Enable good alliance between patient and hospital	Compensate for body language and other physical small signs	Provide the first meeting to be physical	Economical/material support to patients with insufficient digital equipment and economical means	Provide a safe usage for "violence in close relationship" patients	Enable patient's focus to be on the meeting	Enable multiple parts to join meetings	More focus on individual matters during meetings	Fast diagnose	Useful remiss	Fast to recieve working treatment	Decrease follow-up queues	A lot of doctor time per patient	Involve non-users of digital equipment early in development of services	Establish and develop cooperation with local patient organisations	Good coordination within hospital	Good continuity for patients	Practical support to tackle governmental authorities	Satisfying amount and density of follow-ups
						Enable userfriendly digital parts											Enable digi-physical meetings										Improvement of healthcare					
86	87	88	89	90	91	92	93	94	95	96	97	98	66	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118

Appendix B – List of Metrics

The *List of Metrics* contains 121 different metrics with the purpose to be able to verify the ability to satisfy the stakeholder needs. Each metric has a unit of which one can evaluate the metric and thereby also the underlying needs. In the *List of Metrics*, no metrics for the primary needs from the *Stakeholder's Needs List* are seen. This is because all primary needs in their turn contain the secondary needs with their metrics, which are seen written with standard letters, and the tertiary needs metrics, written in italicized letters and moved slightly to the right.

Metric Metric Metric Image
Metric No. Need Not. Metric 1 1 Have a booking system for both first time appointment and follow-up meeting 2 2 2 Provide canada application interion 3 3 Different options for parter on how to get contacted 4 4 Provide canada application interion 5 Provide canada application interion Englewing service 6 6 Englewing service Englewing service 9 9 Notification with "your carregiver" 11 11 Englewing application in the endlewing service 12 12 Englewing application in the endlewing service 13 13 Frant response 14 14 14 Provide canada application in the endlewing application i
Metric No. Need No. 1 1 2 2 3 3 5 5 6 6 7 7 8 8 9 9 9 9 11 11 12 12 13 13 14 14 15 13 16 10 17 11 18 18 19 19 20 20 21 21 22 23 23 24 24 25 25 25 26 27 28 28 33 33 34 33 35 33 36 23 37 33 38 33 37 33 38 33
Metric No 1 1 2 3 3 4 4 4 4 4 4 4 4 7 7 7 7 7 7 7 7 7 1 1 1 1

07	Q	Duratida sectos frances	¢	D
- t	£ 5		0,40	Dimary
41	4	Enable coordination of rendb activities	7,0	Binary
42	42	Enable patients to find rehab activities	5,0	Binary
43	43	Enable patients to find excercise buddies	2,0	Binary
44	4	Enable patients to find excercise groups	3,0	Binary
45	45	Enable patients to get in touch with people in same situation	2,0	Binary
46	46	Enable a platform to build up a "shareville operation"	2,0	Binary
47	47	Promote local patient organisations	2,0	% of chronical diseases with at least 1 promoted local organisation
48	48	Provide education, lectures, and events digitally	4,0	Binary, Count
49	48	Provide education, lectures, and events physically	4,0	Binary, Count
50	49	Enable data gathering for patient	2,0	Binary
51	50	Enable form filling, patient-healthcare joint	3,0	Binary
52	51	Only enable patient to fill in relevant data	2,0	Patient evaluation, Hospital evaluation
53	52	Enable regular diary data gathering over time	2,0	Binary
54	52	Enable regular well being data gathering over time	2,0	Binary
55	53	Owner of the data must be trustworthy	4,0	Backed by hospital
56	54	Enable patient to set motivated in his/her self-care	2.0	Patient evaluation
57	55	Provide a satisfying amount of follow-up on self-care matters	2.0	Patient evaluation
285	29	Provide a fast introduction to mental self-care after chronical diagnose	40	Davs
59	57	Enable the self-care to connect to nersonal goals and sub-goals	3.0	Binarv
60	85	Findle moores overview	2.0	Binary
61	59	Enable easy access self-care tools	-10 9'0	Evaluation
63	909	Provide exercise videos	3.0	Binarv
63	61	Provide exercise schedules	3.0	Binary
64	6	Provide nutrition schedules	3.0	Binary
5	5	Provide treatment manuals	3.0	Binarv
66	3	r rotation in contraction Derividad fina evolution sossione	1.0	Dinory
00	5 3	Frowae arguan tive excertise sessions Provide feed of news latest functions and add-ons	3.0	DIIIary Rinary
5	50	TOTAL POUNT POUNT AND	0,0	Count I for
09 90	00	Enable data import from external applications Finable data evenue to external annifications	3.0	Count, LIST Count I ist
60	6		0,0	
70	88	Enable calender function with notifications and alarm	3,0	Binary
71	69	Provide quality assured information	4,0	Evidence based
72	70	Provide regular updates of information	4,0	Updates/year
73	71	Provide information about professions internally	3,0	Binary
74	72	Provide information about professions externally	6,0	Binary, Count, List
75	73	Provide information on what patients can expect of the hospital	4,0	Binary
76	74	Provide information on what the patient can demand of the hospital	2,0	Binary
LL	75	Provide clear information on different illnesses	2,0	Evaluation
78	76	Provide clear information on different treatments	2,0	Evaluation
79	LL	Provide information to other authorities, employers and institutions	2,0	Binary
80	78	Provide information to near related to different illnesses	3,0	Binary
81	79	Provide clear information about fertility- and sex-related issues on different illnesses	4,0	Binary, Evaluation
82	80	Provide a FAQ on different illnesses	1,0	Binary, Count, List
83	81	Provide equivalent information to non-users of digital equipment	4,0	Evaluation
84	82	Provide education programs for hospital staff	1,0	Binary
85	83	Provide education programs for the most common used digital applications and tools	4,0	Count, List, Evaluation
86	84	Provide information on how to do some "easy things" yourself that welfare officers provide today	4,0	Binary, Count, List, Hospital evaluation
87	85	Links to relevant external webpages (fund applications, surveys, information sources, etc.)	4,0	Binary

Evaluation	Binary	Binary	Evaluation	Binary	Count	List of requirements	~ ~	Binary, Evaluation	Binary	Hospital evaluation	Binary	Binary	% of information provided as audio		Durat Transferrence	Patient-, Hospital evaluations	Patient-, Hospital evaluations	% of patients	Binary	Binary	Evaluation from hospital	Binary	% of meeting	Davs	% of patients dismissed that at later occation been	directed to a department	Weeks	Days	s	Binary	% of chronical diseases with at least 1 cooperative local patient organisation	Hospital evaluation	Patient evaluation	Binary, patient evaluation	Times/vear
4,0	4,0	4,0	6,0	6,0	4,0	2,0	3,0	2,0	2,0	4,0	4,0	4,0	4,0	c	0,2	5,0	4,0	2,0	4,0	4,0	4,0	3,0	3,0	2.0	2,0	-	4,0	2,0	2,0	4,0	2,0	3,0	2,0	4,0	3.0
Provide short and informative information	Provide information through text	Provide information through videos	Use an easy and intuitive interface with evident icons	Enable integrability to already existing platforms	Use few patient accounts	Low hardware requirements to use the digital services	Provide a fast digital support to hospital	Easy understandable evaluations with smileys or scales	Enable evaluations to have a textbox to clarify if wanted	Transferable digi-physical concept to other departments	Enable screen sharing	Enable video meetings	Provide audio information			Enable good alliance between patient and hospital	<i>Compensate for body language and other physical small signs</i>	Provide the first meeting to be physical	Economical/material support to patients with insufficient digital equipment and economical means	Provide a safe usage for "violence in close relationship" patients	Enable patient's focus to be on the meeting	Enable multiple parts to join meetings	More focus on individual matters during meetings	Fast diamose	Useful remiss	-	Fast to recieve working treatment	Decrease follow-up queues	A lot of doctor time per patient	Involve non-users of digital equipment early in development of services	Establish and develop cooperation with local patient organisations	Good coordination within hospital	Good continuity for patients	Practical support to tackle governmental authorities	Satisfying amount and density of follow-uns
86	87	87	88	89	90	91	92	93	94	95	96	76	98	5	001	001	101	102	103	104	105	106	107	108	109		110	111	112	113	114	115	116	117	81 71
88	89	90	91	92	93	94	95	96	97	98	66	00	101		701	103	104	105	901	20	08	601	110	Ξ	112	0	113	114	115	116	117	118	119	120	21

Appendix C – Target Specification

The *Target Specification* is the final part of the measure and analyze stage and is a sequel to the *List of Metrics*. Its purpose is to provide information about what the accepted and wanted values of the metrics are, displayed as *Marginal value* and *Ideal value*. Furthermore, it provides information on whether the metric and hence the need it is measuring is a requirement or a wish for the final delivery. Both the marginal value and the ideal value of each metric are derived from the thesis performer's understanding and underlying information of the need. Lastly, the *Target Specification* unlike the *List of Metrics* also provides information about how the verification of the metric will be done, how it will be tested that is.

	Verification	Checklist	Checklist	Count	Timing	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Count	Count	Count	Checklist	Questionnaire	Count	Timing	Checklist	 Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Checklist	Questionnaire	Checklist	Questionnaire	Checklist	Charbliet	Onectionnaire	Aucsulonnanc
	Ideal Value	ı		4	600	True	True	•	True	True	True	True	True	2	>50	σ	True	>50% positive answers	100	3	True	True	True	True	True	True	True	True	ı	True	True	True	True	True	>50% positive answers		>50% positive answers	True	aint F	-75% nositive answers	>1.270 PUSHIVE ALLAWELS
	Marginal Value	True	True	0	006	False	False	True	False	False	False	False	False			0	False				False	False	False	False	False	False	False	False	True	False	False	False	False	False		True		False	Ealca	50% nositive answers	20070 PUSILIVE ALLOWERS
	Units	Binary	Binary	Count	S	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Working days	% of total digital services compatible with phone	Places promoted in per department	Binary	Patient evaluation	% of total number diagnosed with chronical disease	Days	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary	Binary, Patient evaluation	Binary	Binary	Binary	Binary	Binary	Patient evaluation	Binary	Hospital evaluation	Binary	Binary	Hosnital evaluation	FIUSPITAL EV AUMAUNI
	Imp.	6,0	4,0	4,0	3,0	3,0	3,0	5,0	3,0	4,0	3,0	4,0	3,0	3,0	3,0	4,0	3,0	3,0	2,0	2,0	3,0	2,0	1,0	2,0	4,0	2,0	3,0	2,0	4,0	2,0	2,0	2,0	2,0	2,0	3,0	4,0	3,0	3,0	1,0	4.0	ţ Č
	D/W	D	D	M	M	M	M	Δ	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	D	M	M	M	M	M	M	۵	M	M	M	6	د
	Metric	Have a booking system for both first time appointment and follow-up meeting	Have an errand application function	Different options for patient on how to get contacted	Fast completion	Provide contact info to healthcare	Enable direct contact with "your caregiver"	Enable message service	Provide verification of recieved message	Not to finish errand before patient feels done	Enable voice messages	Enable text messages	Enable file attachment	Fast response	Take advantage of phone technology	Promote existing digital services	Acute matters should be highlighted	Efficient sifting of patients with welfare officer care need and those without	Establish welfare officer care contact with all patients diagnosed with a chronical illness	Fast welfare officer care contact after diagnosed with a chronical illness	SMS notification to inform patient of that welfare officer care could be provided	Enable patient-healthcare joint patient control over treatment	Enable overview of treatment, goals and progress	Enable renewal of prescriptions	Enable patient to reach journal	Notification when new information of current errand/treatment is available	Clarify treatment options	Provide patient-healthcare joint meeting planning	Enable work with personal goals	Enable goal and sub-goal planning	Enable creation and overview of action plan	Enable creation and overview of life planning	Enable progress overview	Enable calender function with notifications and alarm	More options and decision making for patient during treatment	Enable to switch between digital and analog treatment during treatment time	Enable easy patient communication between healthcare and welfare officer care	Provide evaluations and feedback of treatment to hospital	Enable informationsharing of patients between hospitals and child- grown up health care	IIISUUULIOUS OF ULLETEUL LEGIOUS Enable interver overview of nationt well being for the hosnital	ERINDE IRRACI OVER VIEW OF PAUERIE WER DERING TOT ALE HOSPIRAL
Need	Nos.	-	2	3	4	5	9	7	8	6	10	Π	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	30	50
Metric	No.	-	2	3	4	5	9	7	8	6	10	Ξ	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	30	70

Questionnaire	Checklist	Checklist	Questionnaire	Checklist	Count	Checklist	Timing	Checklist	Checklist	Questionnaire	Checklist	Checklist	Count	Checklist	Questionnaire	Questionnaire	Count	Checklist	Checklist	Questionnaire	Checklist	Count						Checklist				Checklist, questionnaire	
>75% positive answers	True	True	>75% positive answers	ı	1	Average phone and computer	180	True	True	>100% positive answers	True	True	100		>75% positive answers	>50% positive answers	100	True	True	>75% positive answers	True	>75	1			1	ı	True		ı		>50% positive answers	
ı	False	False	>50% positive answers	True		-			False	>75% positive answers	False	False	1	True	>50% positive answers			False	False		False		1	I				False	1			False	
Evaluation	Binary	Binary	Evaluation	Binary	Count	List of requirements	s	Binary, Evaluation	Binary	Hospital evaluation	Binary	Binary	% of information provided as audio	Binary	Patient-, Hospital evaluations	Patient-, Hospital evaluations	% of patients	Binary	Binary	Evaluation from hospital	Binary	% of meeting	Days	% of patients dismissed that at later occation been directed to a department	Weeks	Days	S	Binary	% of chronical diseases with at least 1 cooperative local patient organisation	Hospital evaluation	Patient evaluation	Binary, patient evaluation	Timochion
4,0	4,0	4,0	6,0	6,0	4,0	2,0	3,0	2,0	2,0	4,0	4,0	4,0	4,0	2,0	5,0	4,0	2,0	4,0	4,0	4,0	3,0	3,0	2,0	2,0	4,0	2,0	2,0	4,0	2,0	3,0	2,0	4,0	¢
≩	M	W	D	D	M	W	M	M	W	W	M	W	M	D	Ω	M	M	M	M	W	M	M	M	M	M	M	W	W	M	M	W	M	11.7
Provide short and informative information	Provide information through text	Provide information through videos	Use an easy and intuitive interface with evident icons	Enable integrability to already existing platforms	Use few patient accounts	Low hardware requirements to use the digital services	Provide a fast digital support to hospital	Easy understandable evaluations with smileys or scales	Enable evaluations to have a textbox to clarify if wanted	Transferable digi-physical concept to other departments	Enable screen sharing	Enable video meetings	Provide audio information	Enable physical tests and evaluations	Enable good alliance between patient and hospital	Compensate for body language and other physical small signs	Provide the first meeting to be physical	Economical/material support to patients with insufficient digital equipment and economical means	Provide a safe usage for "violence in close relationship" patients	Enable patient's focus to be on the meeting	Enable multiple parts to join meetings	More focus on individual matters during meetings	Fast diagnose	Useful remiss	Fast to recieve working treatment	Decrease follow-up queues	A lot of doctor time per patient	Involve non-users of digital equipment early in development of services	Establish and develop cooperation with local patient organisations	Good coordination within hospital	Good continuity for patients	Practical support to tackle governmental authorities	
86	87	87	88	89	90	91	92	93	94	95	96	76	98	66	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	
88	89	90	91	92	93	94	95	96	77	98	66	00	01	02	03	4	05	06	20	08	60	10	11	12	13	14	15	16	17	18	19	20	:

Appendix D – Concept Combination Table

In appendix D the Concept Combination Table is presented. It shows the generated ideas to solve the functions enabling the concept that the project aims to build.

	Ameler to meter of the and	
Informed of wentare Officer Care	Apply to wellare Ullicer Care	Get Introduced to Self-Care
Phone call	Online form application BankID	Phone call after application
Traditional text	Phone call time booking	Traditional text after application
By serving doctor	E-booking	(Online) Brochure/ list of available services
Information on hospital exclusive account	Traditional text application	By welfare officer after contact
(Online) Brochure/ List of available services	Chat application	Outsource to patient organisations
Social media group information for each special treatment department	IRL drop-in	Introduction lecture
Introduction lecture	Online form application exclusive account	Social media group information
Displays throughout hospital		Information on hospital exclusive account
		Displays throughout hospital
Traditional text - Mail. E-mail. SMS		
Contact with wolfare Officer / Pollow-un	Calf-Cara	
COMMANY WITH WEMARY OTTICET / FOMOW-UP		
Digi-physically with own platform	Own interactive platform	
Digi-physically with existing apps	List of good links and literature	
	Schedule from hospital	
	Educated by welfare officer	
	Outsource to patient organisations	
	(Online) Brochure/ List of available services	

Appendix E – Generated Concepts

In appendix E the generated concepts are presented as a whole to get an overview of all concepts on one page.

Α	B	С	D	ш
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Phone call	Phone call time booking	Traditional text after application	Digi-physically with existing apps	Educated by Welfare officer
	œ	(0	
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Traditional text	Phone call time booking Online form application BankID	Traditional text after application	Digi-physically with existing apps	Educated by Welfare officer Own interactive platform
	q	(c	u
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor (Online) Brochure/ List of available services	Phone call time booking Online form application BankID	(Online) Brochure/ list of available services	Digi-physically with existing apps	Educated by Welfare officer (Online) Brochure/ List of available services
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Traditional text	Phone call time booking Online form application exclusive account	Information on hospital exclusive account	Digi-physically with own platform	Educated by Welfare officer Own interactive platform
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Social media group information for each special treatment depar	Phone call time booking tur E-booking	Social media group information	Digi-physically with existing apps	Educated by Welfare officer Outsource to patient organisations
V		0		
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Traditional text	Phone call time booking Chat application	Traditional text after application	Digi-physically with existing apps	Educated by Welfare officer List of good links and litterature
- V	B	U		
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Introduction lecture	Phone call time booking E-booking	Introduction lecture	Digi-physically with existing apps	Educated by Welfare officer Outsource to patient organisations
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor (Online) Brochune/ List of available services	Phone call time booking Online form application BankID	(Online) Brochure/ list of available services	Digi-physically with existing apps	Educated by Welfare officer Own interactive platform
	m	U		
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving docto	Phone call time booking Online form application exclusive account	Information on hospital exclusive account	Digi-physically with own platform	Educated by Welfare officer Own interactive platform
<	c			
Informed of Welfare Officer Care	Apply to Welfare Officer Care	Get introduced to Self-Care	Contact with Welfare Officer / Follow-up	Self-Care
By serving doctor Traditional text	Phone call time booking Online form application BankID	Traditional text after application	Digi-physically with existing apps	Educated by Welfare officer (Online) Brochure/ List of available services

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