School of Computing
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The PACT Analysis Framework

A case study of 1177.se

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Abstract

In 2010 the new Swedish national system for health care 1177.se was launched in order for users to have one place where to find health care related information. The primary stakeholders of this system, which is online based, are the counties and regions of Sweden.
The purpose of the thesis is to identify what improvements can be made on the health care system in order to benefit new technologies and in the end the users.

The main question that the thesis will address is:

- How can a PACT analysis improve the design of health the health care system 1177.se to benefit new technologies in order to be as available as possible.

The method that has been used in order to gain knowledge in the subject has been literature studies, observations, scenario building and also an interview.

The analysis of the empirical and theoretical studies has shown that more attention should be placed on people that have different disabilities and people with other origins then Sweden. People that are not so comfortable with Internet technology also is a group of people that needs to be placed in focus.

Keywords: 1177.se, Interactive Health Care System, Interactive Design, PACT Analysis.

Executive Summary

1177.se is the new Swedish health care site that was launched in 2010. The initiators of this are the different counties and regions in Sweden. 1177.se is supposed to be the leading resource for the Swedish citizens when it comes to information, and advice about health, health care and dental care.

Over the past decade the Internet has evolved so much so health care can make use of it to benefit the citizens of Sweden. The counties and regions saw it as a possibility to use one place for all citizens to find information about health, health care and dental care.

Sweden has got about 9,5 million citizens (SCB, 2011) who all at some point get in contact with Swedish health care. The can suffer from some sort of disease, want to ask a question, find where different resources in their local area is situated or look through information themselves. There are multiple areas of application for the health care system 1177.se so thinking about how you design it is of utter importance.

A PACT (People, Activities, Contexts and Technologies) analysis means that identification of the different activities that people conduct in different contexts using different technologies is made.

This thesis by me is an attempt to analyze the health care system 1177.se and give my ideas of what improvements can be made after having done a thorough analysis using the PACT framework.

Acknowledgement

I want to thank Emma Lennestål1[1] at Inera who was so kind in letting me interview her in order to get the triangulation of the thesis complete.

I would also like to thank Jekaterina Novikova who kept me in good spirit throughout the thesis.

Finally I would like to thank Professor Sara Eriksén for handling my thesis and for being there when having questions.

[1] Approval is given by interview subject to mention both her and the company Inera in this thesis

Contents

1 INTRODUCTION

In this chapter I will explain how I will conduct the work of this thesis. I will explain what method to use and who the thesis is written for. A background of the domain of interest is also given.

1.1 Background

This thesis is within the area of Informatics, which is the area which handles the meeting between people and technologies. The PACT analysis framework analyzes in which contexts people perform activities and with different technologies. The PACT analysis framework ends up in the area of informatics since it deals with how and where people interact with technology.

In the year of 2010 Swedish healthcare decided to open a common way in for all citizens who try to contact Swedish healthcare, 1177.se. This was to make it easier for citizens wherever they are located or where they are moving to. They only have to remember 1177.se. This to modernize, develop and make healthcare more available to citizens. A new version of the health care system has been released with a new look, extended content and new services. Advice and knowledge is given within the domain of health and health care. Anonymous questions are answered personally by doctors and nurses. Finding health care wherever you are in Sweden and using local e-services to contact health care is also possible with the new look of 1177.se.

Behind the health care system is the Swedish health care through all counties and regions working together. 1177.se comes from the telephone number 1177 which is the number to health advice in Sweden. To make it easier and to be more accessible to the Swedish citizens the name 1177.se was created. Inera, which is a company owned by counties and regions of Sweden, is the company who technically manage the system and are responsible for the layout of the Swedish health care system. Information on consists of thousands of articles and each county is responsible for the content in their own sections.

1177.se has about 1 million visitors per month (statistics for 2011) and the most popular themes are the ones displaying information about Children and parents and pregnancies. The Health care advisors accept about 4,5 million phone calls per year. The vision of 1177.se is to be the obvious choice when the public wants advice, information, knowledge and services within health,

health care and dental care. 1177.se is also supposed to be a tool for the people working in the health care industry. Last 1177.se is supposed to be easy to use, be usable and be reliable. In covering those aspects user centered design, which is where user´s needs are considered and worth striving for (Kaptelinin, 2006), needs to be the focus of design. In order to be usable, focus also needs to be directed towards accessibility (Krug, 2006) since a system isn't really usable until it is accessible to all users, such as for instance people with disabilities. Also in order to be accessible and usable the systems have to be available which basically means the amount of time a system is in a functioning condition (Wikipedia, 2011).

New technologies are evolving rapidly and this along with increasing convergence of different technologies affects how information is being accessed and how people communicate around and through health services. Usability of health care systems such as 1177.se thus becomes not only a question of designing for usability of the web pages for access via Internet on personal computers, but also of making information and communication available, useful and usable via new technologies such as mobile phones, ipads etc. What user groups are actually using the national health information portals today, in what contexts, to support what activities, and what technologies are they using? In order to explore these issues I will study 1177.se using PACT analysis.

People undertake activities, in contexts using technologies.
• A gym sms:es their customers about free slots in schedules
• Ambulance people work together using computer, phones and other devices of communicating in order to save patients' lives.
• A bank woman presses the alarm button while being robbed.
Each of these examples has people who undertake activities in contexts using technologies.

An essential part of designing health care systems that are interactive is that it should put people first; it should be human-centered. We use the acronym PACT (People, Activities, Contexts, Technologies) as a useful framework for thinking about the design situation. Designers also need to know about the features of interactive technologies and how to approach designing interactive systems. The aim of human-centered interaction design is to harmonize the PACT elements in a particular domain. Designers want to get the right mix of technologies to support the activities being undertaken by people in different contexts. A PACT analysis is useful for both analysis and design activities; understanding the current situation, seeing where possible improvements can be made or envisioning future situations. To do a PACT analysis the designer simply scopes out the variety of P, A, C and T:s that are possible. This can be done using brainstorming and other envisionment

techniques (e.g., draw pictures, sketches, cartoons, cut out pictures from magazines and stick them on a board).and by working with people through observations, interviews and workshops.

The results can be written up as detailed concrete ‘scenarios of use’. Scenarios are stories about people undertaking activities using technologies in contexts. Develop conceptual scenarios that cover the main activities that the technology has to support. Develop concrete versions of these for specific designs of the technology. For example - a conceptual scenario might say ‘Peter logs onto the computer’, and a concrete version might be ‘Peter clicks on the “log on” icon’.

People use technologies to undertake activities in contexts. For example, a gym sending SMS to their customers about free slots in schedules, ambulance people work together using computer, phones and other devices of communicating in order to save patients’ lives, A bank woman presses the alarm button while being robbed. Each of these examples has people who undertake activities in contexts using technologies.

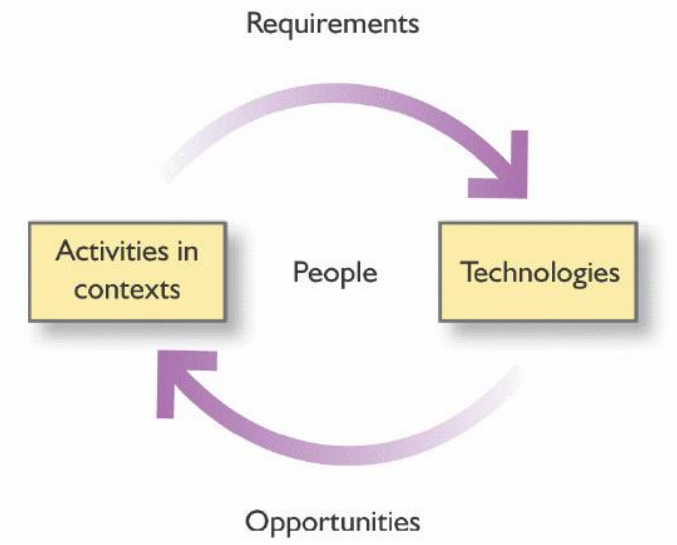


Figure 1 Source: Carroll (2002)

Activities and Technologies
By looking the different activities that are performed in different contexts you get requirements for new technologies.
By adding new technology you get opportunities for the people to perform even more activities in other contexts.

PACT analysis

- Doing a PACT analysis can be helpful when starting a new design

- The analysis is good both for when analyzing something that exists or when creating a new design
- You become aware of what the current situation looks like
- You get results of what areas of the design that is open for improvements
- The visualization of the future situations can be made with an analysis
- When doing a PACT analysis y9ou need to try and see the different Ps, As, Cs, Ts

1.2 Problem definition

Sweden has over 9 million citizens, all with different characteristics. Some of them are sick; some are looking for information; some wants to ask questions and some might want to book a time with a doctor. It is important that as many citizens as possible can access the information provided by the counties. It is not only important for the citizens to find information, but also that the information is correct and that the citizens can see and understand the information. That means that the information needs to be well structured and fit all the citizen's needs.
When designing a health care system like 1177.se it is common that focus is only on usability and accessibility forget to put the people using the health care system in focus. It is important to have a human-centered approach when designing a health care system for a population with so many different characteristics. It is also hardly ever considered in what activities the citizens are performing while interacting with technology to get the information. It is also important, not only to include citizens in the design of the health care system, but also the ones putting up information on the health care system so that the correct information comes in the correct place. Many stakeholders need to be considered in the design since otherwise the information will get outdated, put in the incorrect place or even worse, might cause injury if a citizen get access to the incorrect information. By focusing on the citizens the health care system will becomes more attractive than if you only let a, for instance, design firm do the job.

1.3 Aim and research question

The research question is how PACT analysis can improve the design of health information systems to benefit new technologies in order to be as accessible as possible.

Subgoals

- See which improvements can be made depending on activities in contexts.
- See which opportunities there are, if any.

The aim of this thesis is to give suggestions on how to improve the design of interactive health system to become more usable to the citizens. The research is completely focused on the user and not the technology itself. By focusing on the user I think that information gets more available and more accessible.

1.4 Target group

The thesis is targeted at those people working with developing services that include people working with technology but also the scientific and research community, doctors and medical personnel and other providers of assisted technology. People interested in the design of interactive health system might also find this thesis useful, but also students and faculty members who have an interest in interaction design and web design around health care.

1.5 Delimitation

This study will only focus on people that have access to the Internet and that is located in Sweden, since 1177.se is a health care system for Swedish citizens. I will not be judging the actual design of the health care system but only the activities surrounding the service.

2 METHOD

In this chapter I explain how, from theory and empiricism, I have taken on the problem area to be able to address the research questions.

2.1 Choice of subject

The reason why I chose this subject is because I work within the health care industry in Sweden. I have seen that more focus on information systems within health care has become more prominent the past few years. Since I have a genuine interest in interaction design I saw that a thesis that might help future health care is something that I really feel a commitment for. My hope is to give advice on how to improve 1177.se to become a better service for the Swedish citizens. I will in this focus more on the availability aspects of the Swedish health care system 1177.se then the actual system itself. It is important that the users of the system actually get the information that they want. This in order to keep the system alive and to get returning visitors.

2.2 Method of Analysis

The method I will be using in this thesis is a qualitative study. Qualitative studies often gathers data from multiple sources such as interviews, own observations and other types rather than having only one source from gathering data (Creswell, 2009). Figure 2 shows some examples of different methods in a qualitative analysis. If I were to have used a quantitative method I do not think I would have gotten the many different aspects as now. Using a mixed method could also have been a way of conducting this study since I could then have refined the results in a quantitative study with a qualitative once or the opposite. I do however think that there would have been no change in the results of the thesis.

Interviews	Gathering qualitative oral or written response of participant about opinions, facts, and behavior attitudes experiences.
Content Analysis	By deconstructions of written, visual and oral, narratives.
Focus group	Group of participants discuss specified or told idea or topic usually supported by a moderator.
Observation Participatory design	Observing and make recording of such behavior and preferences, which is analyzed in order to explain obviously criteria developed by the researchers.
Usability test	Gather information from products, visibility testing of products and services.

Figure 2 shows examples of qualitive ways of research (Davy & Valecillos, 2009)

2.3 Data collection

I will be using a triangulation which means I will be using data from three different sources. This is in order to get as accurate data as possible and from many different viewpoints. I will be conducting an interview with one person well introduced in the work with the health care system 1177.se working at Inera called Emma Lenneståhl. Inera is the organization that had the responsibility to create the health care system 1177.se. I will also be making own observations from a PACT perspective. The reason why I am using own observations is since I am involved with the Kalmar county council in some work surrounding the Kalmar county part of 1177.se. I consider myself being knowledgeable in the area of the Kalmar county council section of 1177.se. Finally I will be using scenarios where I will build two personas using the health care system 1177.se.

2.4 Choice of interview subject

Since I wanted to see what the perspective was when making the health care system 1177.se I thought it would be important to interview one of the persons that was included in the project in making the health care system 1177.se. The interview has been conducted with Emma Lenneståhl who works at Inera, which is the institution, owned by counties and regions that had the task in creating the health care system 1177.se. The interview was conducted in two stages. First of all I sent Emma the interview questions so that she got some time to prepare the answers. After a few weeks we decided to have a meeting over the phone, where she got a chance to explain the different answers and also ask me as an interviewer what some of the questions meant.

2.5 Credibility

To establish credibility with a qualitative analysis one can make a triangulation (Redfern & Norman, 1994), which is what I chose by using own observations, interviews and scenarios. Guba & Lincoln (1981) means that when others can get new experiences by only reading about them a qualitative data becomes credible.

2.6 Literature review

I have done a literature review of interesting articles, books and have also done web searches to find interesting information within the domain in question. A literature review is performed because I wanted to see what theoretical findings have been made in the domain of interest. By trying to find information in many different places vouches for more relevant information within the selected domain. By summarizing what I have found in the theoretical work, I have also been able to compare my findings and see if the theoretical work matches my findings in the empirical work.

Searching for information has led me to use the resources Google scholar, ACM digital library, Summon@BTH (the search engine of the library of Blekinge Institute of Technology), Samsök, books, articles and all sorts of search engines. The search engines I have used are Google, Yahoo and Bing.

The search terms that have been used in search engines are PACT, people activities contexts technologies, user-centered design, design availability, design accessibility.

Since some of the sources are Internet sources like Wikipedia I have tried to be critical towards the source and tried to use it as little as possible. The information I have used from Wikipedia might not be considered a proper source, which is why I have tried to use it when there is only general information.

2.7 Research process

To show my different roles in the research process I have chosen to visualize this through a basic process picture, figure 3, which shows my roles as a researcher and interviewer and the connection between them in the collection of data and analysis of the same.

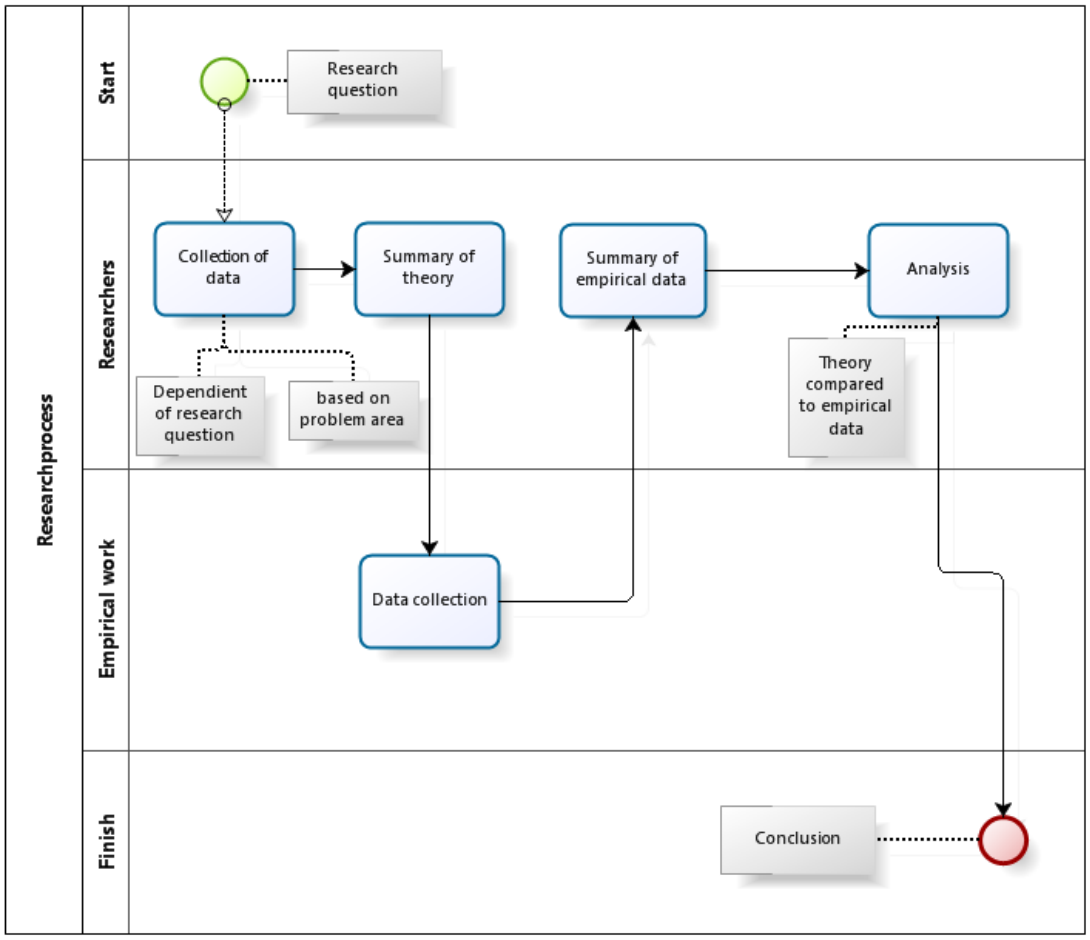


Figure 3. Research process

3 THEORY

In this chapter information about what PACT is will be explained from the theory that is chosen and explain central terms that are relevant for this thesis. The theory will create a continuance for my empirical studies.

3.1 HCI

Human computer Interaction is about the interaction between people and technologies, which means interaction, planning and the design of how people interact with technologies. The ACM or Association for Computing Machinery, which is a learnt society for computing, defines human-computer interaction as a discipline which is concerned with the design, evaluation and implementation of interactive computing systems for humans to use and with the study of major phenomena surrounding them. The interaction between people and technology occurs at the user interface and that includes both hardware and software. For example a mouse, a monitor and other peripherals are items that people interact with technology with. If thinking in larger scale examples like aircrafts and power plants spring to mind. (Wikipedia, 2011).
A basic goal of HCI is to improve the interactions between users and computers by making computers more usable and receptive to the user's needs. In figure 4 the different aspects of HCI can be seen.
Kaptelinin & Nardi (2006) thinks that design must meet two criteria: that it should be rich enough to capture important aspects of how using technology and descriptive and generalizable enough to be practical.

HCI also concerns areas like:

- methodologies and processes for designing interfaces (i.e., given a task and a class of users, design the best possible interface within given constraints, optimizing for a desired property such as learnability or efficiency of use)
- methods for implementing interfaces (e.g. software toolkits and libraries; efficient algorithms)
- techniques for evaluating and comparing interfaces
- developing new interfaces and interaction techniques
- developing descriptive and predictive models and theories of interaction (Wikipedia, 2011)

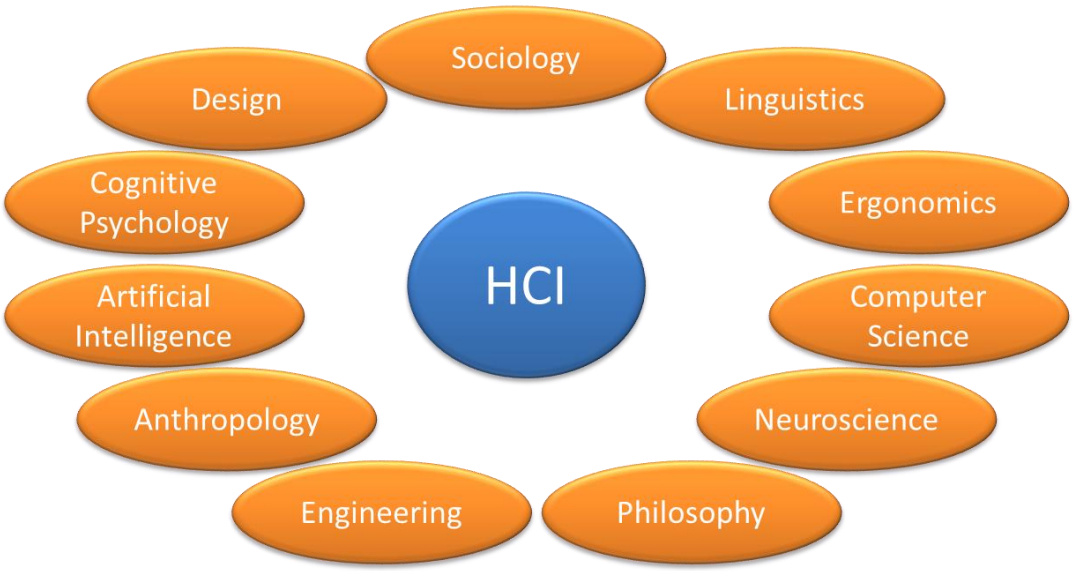


Figure 4 shows the vast variety of areas where HCI occurs

To show how Human-computer interaction and PACT-analysis fits together in figure 5 you see a graphical overview.

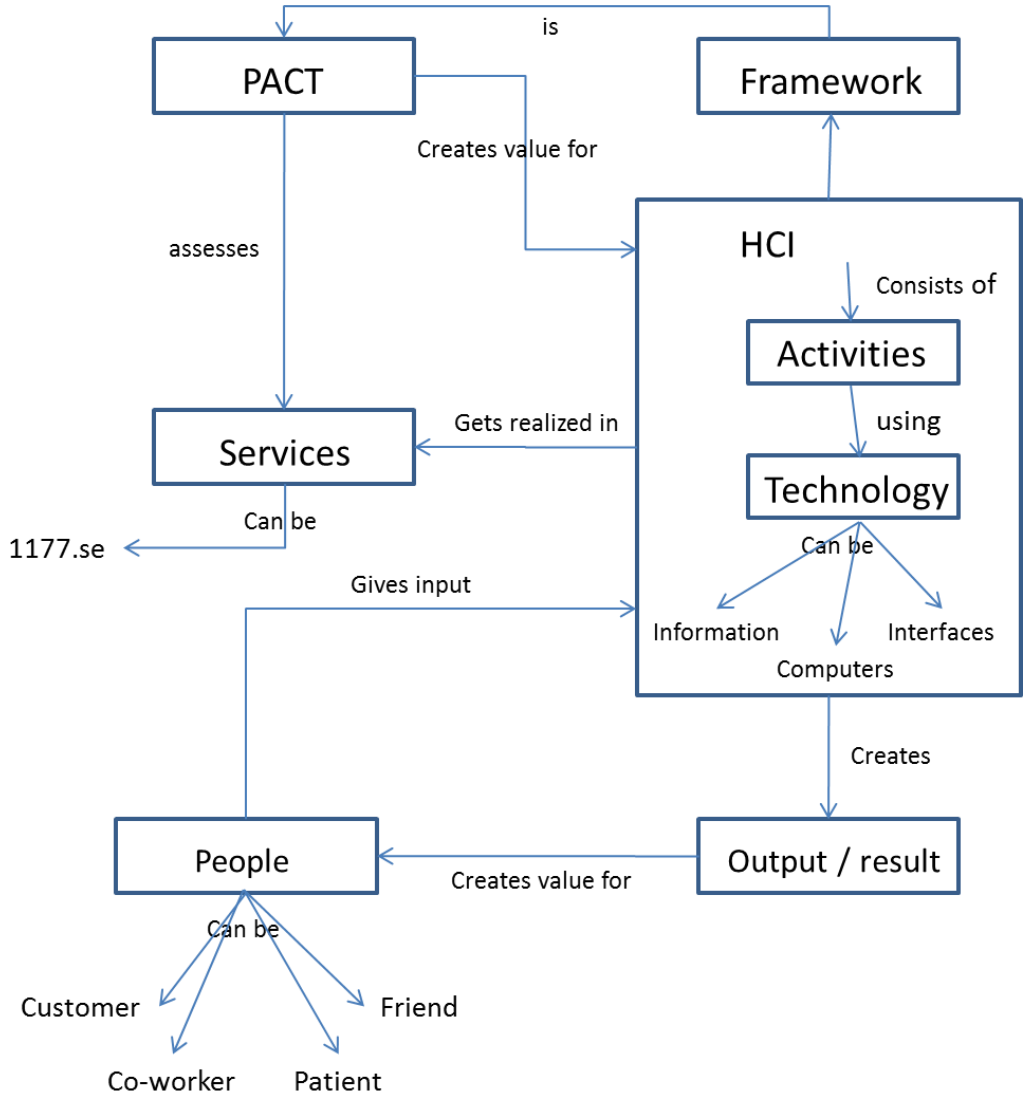


Figure 5 shows how HCI, 1177.se and PACT fit together

3.2 1177.se

1177.se is the counties and regions common service to the public for advice about health care. You can find health- and sick care information, make anonymous questions and get a personal response, look for health care in the whole of Sweden and use local e-services to contact the local health care.

The texts on the health care system are written by doctors, nurses, dentists and pharmacists from all over the country. The texts are being reviewed in multiple steps before being published and are regularly updated by the national editorial office for 1177.se. Specific texts and services from counties and regions are the responsibility of the regional editorial offices. Apart from

texts there are also movies and stories. No commercial interests govern the health care system.

When visiting 1177.se the health care system contains different themes like: Children and parents, pregnancy, the body, cancer, life and health, travel advice and vaccination and teeth. Figure 6 shows what 1177.se looks like.

Current information about the different counties is also available. Depending on where you live you can adapt the health care system to get news, information and links to the e-services in the area the person lives. Helseplan (2011) did a review of the Region Skåne part of 1177.se and concluded that 1177.se is accessible for “normal” people and people with some disabilities such as people with bad eye sight.

People can also compare different areas of health care by for instance comparing availability and see what other users think. You can also log in to ”My pages” and find your own contacts.

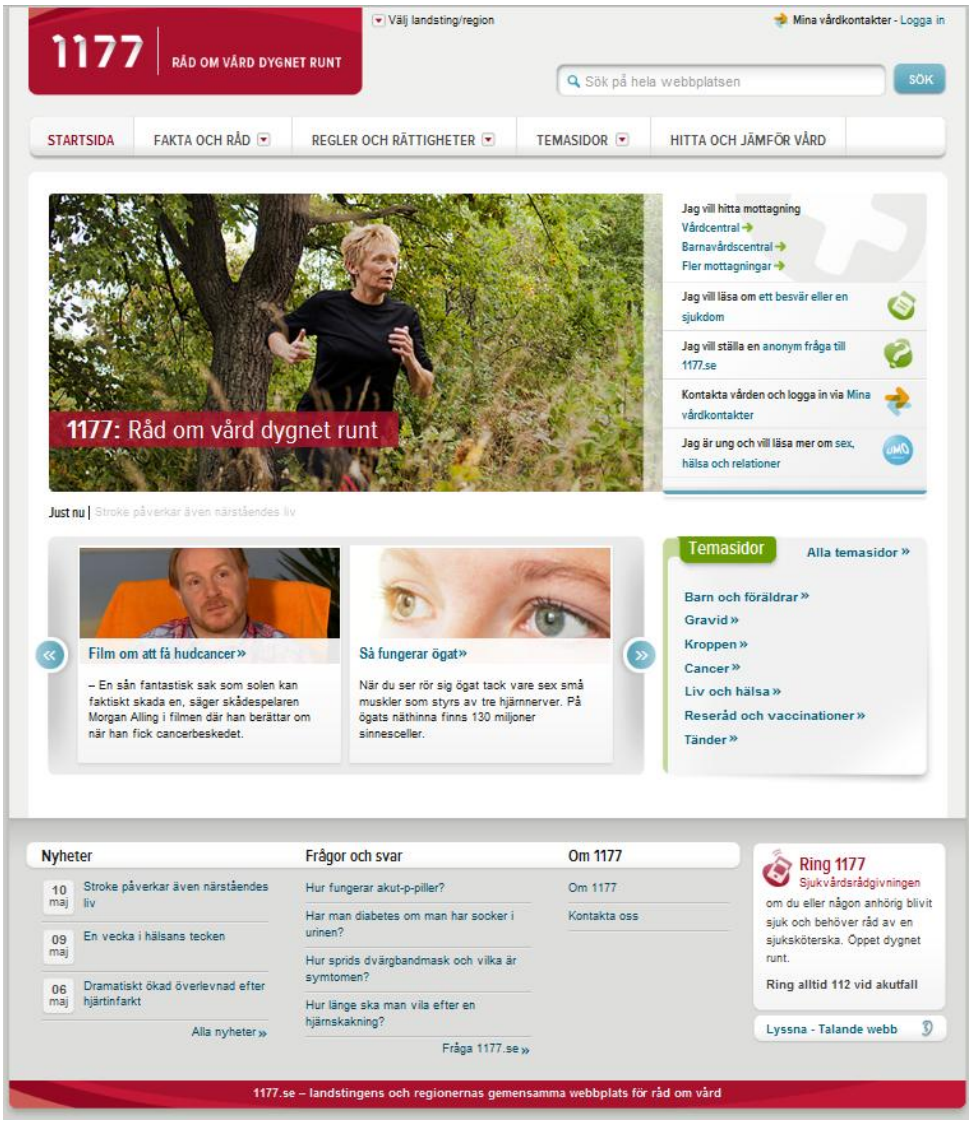


Figure 6 shows an illustration of 1177.se

You can read about the following on 1177.se:

- Diseases, injuries and symptoms
- Examinations, treatments and medicines
- Pregnancies and childbirth
- Cancer
- Parenthood and child health care
- Travel advice and vaccinations
- Health and feel-well-advice
- How to handle difficulties and crisis
- What the health body looks like and how it works
- Rights and obligations for patients and for health care personnel
- What aids are available when having a disability

The overall purpose for 1177.se is to encourage health and to strengthen the patients' position to contact and interact with health care. Hedblom (2010)

notes that the 1177.se and the health care advice number 1177 has no interaction and cooperation between them when it comes to information about medicines.

The health care system is supposed to increase the public knowledge by offering cost free, reliable and easy to read information. Hedblom (2010) writes that more interactions is needed between the health care system and the cooperation with the health care advice organization.

All national content is reviewed in three different instances before being published and all information is regularly updated (1177.se, 2010).

3.3 PACT

People are using technologies to undertake activities in contexts (Benyon, 2005). PACT stands for People, Activities, Contexts and Technologies. PACT was sprung out of the HCI concept and was thought to explicitly cover both social and technological aspects. PACT was a good way of ensuring that systems being evaluated were actually easy for people to use. Anderson (2011) writes that using a PACT analysis enables a greater understanding in existing systems. Since people use technologies in different contexts the PACT framework was born in order to cover all aspects of human centered interaction. The Pact analysis tries to see where activities are conducted with which technologies in different contexts. The variation of each of these four elements makes designing interactive systems very hard, but also fascinating. Technologies will always be there to support everyone to perform activities and when new technologies appear the way of performing the activities changes (Benyon, 2005). If technology changes also the nature of the activities will change. Anderson (2011) writes that a PACT analysis is very useful in existing systems and Benyon (2005) means that a PACT analysis is good as a starting point for design. Figure 7 illustrates nicely what PACT is all about.

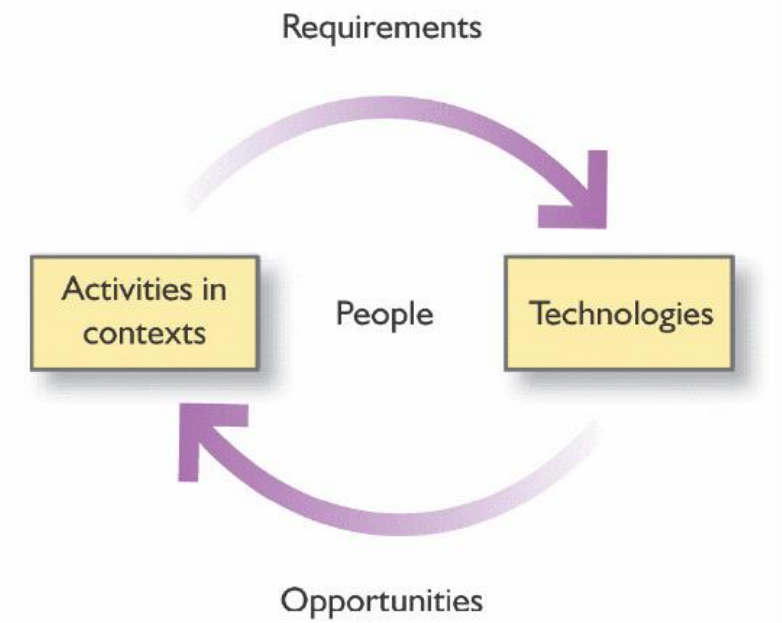


Figure 7 Source: after Carroll (2002)

Figure 5 nicely illustrates how activities in contexts create requirements on the technologies, but also that technology creates opportunities for activities when technologies changes (Benyon, 2005). For instance imagine the telephones that started with switchboards, continued with regular phones to mobile phones. Technology has in that case created opportunities for activities in different contexts. Another example is e-mail that from the beginning was only text based, but now can contain images, video and sound. In that case the activities (e-mailing) creates requirements on technologies (managing of images in e-mails).

3.3.1 People

People are the first part in the PACT framework. Since there are so many different types of differences among people these are divided into three different categories; *physical differences*, *psychological differences* and *usage differences*. Nielsen (1993) points out the importance of knowing the user. By not knowing the user the system will have a greater chance in failing. Steve Krug (2006) mentions that the users shouldn't have to think while browsing or using a system since the thinking makes the focus turn to how to use the system instead of actually using the system.

Physical differences
When talking about physical differences in people things like height and weight immediately comes to mind. However characteristics like different personalities and different cognitive skills and preferences are also a part of

the physical differences. In short one can say variability's in the five senses sight, hearing, touch, smell and taste. Having no hearing might have a different effect with technologies then the effect it would have with a person who has hearing. The question that needs to be asked when designing something is how the physical aspects of people that needs to be taken into consideration (Benyon, 2005).

Psychological differences
People differ in many ways when it comes to psychological differences. For instance some people are more logical then others and then have a much easier time feeling at home when visiting a health care system then those who are less logical. The logical ones will have a much easier time finding their way around. Designers should take this into consideration and design for the ones with poor ability and give clear directions and way to get the people with poor quality a good feeling as well. That way both categories will have it easier on a health care system. Other differences are for instance language. Designers need to keep in mind that there might be several different people all with different languages that might visit. Of course cultural differences will also have the effect that people from different cultures might interpret things in different ways (Benyon, 2005).

Usage differences
Differences in usage covers for instance when an expert and novice use technology and that they use it in different ways. Users that are good i using a system they become experts in no time since they use it a lot whereas novice users need guidance when interaction with technology. There is also a type of user called "discretionary" user who, if put in to a system that is too difficult just leaves. Designers need to take into account these users as well to get as many users to stay as possible. To design a health care system for a homogenous group is very different compared to designing one for a heterogeneous group. Health care systems are often designed for heterogeneous groups to attract as many users as possible (Benyon, 2005).

3.3.2 Activities

Activities can be divided into smaller parts such as *temporal aspects, co-operation, complexity, security critical and the nature of the content*.

Temporal aspects means how frequent a certain activity is performed. The more you perform an activity the more you learn and the easier it gets. For health care systems like health care ones it is important for designers to make the design and readability as clear and simple as possible so that

many people can use the health care system without the need of help (Benyon, 2005).
Temporal aspects also cover other features of activities such as time pressures, peaks and structures of working. When performing activities you might be in a place where no one else is or you might perform it where there are many people gathered. It is then necessary for the design that everyone can find their own place and pick up where they left (Benyon, 2005).There is also an issue about the information system about response times that needs to be considered. If a health care system takes more than 2 minutes to deliver a response it is very frustrating for the user that wants to use the health care system and quite critical if the information on the site is needed for emergencies. When clicking with the mouse a response time of less than 5 seconds is necessary for users not to feel frustrated (Benyon, 2005).

Co-operation deals with if the activities can be carried out alone of if you have to do it together with others. If the activities cannot be performed by oneself awareness of others, communication and coordination becomes important (Benyon, 2005).

Complexity covers the topic of how well-defined the tasks are when performing tasks on a health care system. If the tasks are well-defined it is much easier for a user to be able to manage by themselves, however if they are vague they more than often need help to complete a task (Benyon, 2005).

Security Critical covers the area of if a mistake is done if it could result in an accident or some sort of injury. It is important that the designer pays attention so that there is no risk of anyone getting injured by making a mistake. It is therefore imperative that the designer thinks about what will happen is a user makes a mistake (Benyon, 2005).

The last part covers the area of *the nature of the content* which means that you consider the data requirements of the activities made. For instance if you need to type names, addresses and phone numbers it is almost certain that you need some sort of keyboard to enter the data. Maybe if you want to show a color video you need to have a screen that supports color. What is meant by this is that just as important as the data is the media that the activity requires (Benyon, 2005).

3.3.3 Contexts

When performing activities you always do it in some sort of context, which means you have to take one part into consideration when analyzing the

other. There are three types of contexts that can be clearly identifiable; *social context, organizational context* and *physical circumstances* in which the activity takes place. Basically you can see the context as something that surrounds the activities, in other words activities always takes place in a context. For instance if you see the context as a whole and try and visualize a cash withdrawal machine. The physical circumstances would then be for instance the location of the machine. The social context of the machine would be for example the time spent for the withdrawal of if being forced to stand in a queue. The organizational context could be how the bank interacts with its clients, which in this case is via a cash withdrawal machine. (Benyon, 2005).

Physical environment
The physical environment is the actual place where the activity takes place. For instance, it might be outdoors, indoors, in a zoo or wherever. Physical environment also covers things like if it is sunny outside, raining and other natural aspects. Imagine accessing a health care system from many different places. The activity then takes place in several different physical environments (Benyon, 2005).

Social context
Social context covers the area of how the surroundings around the activity looks like. For instance are there any manuals to help you to perform your activities or maybe there are other people there who can help you perform your activity. There might also be privacy issues to consider, for instance if the activity needs to be protected from others, you need to make sure no other people are around. The health care system might also contain loud music which for would not be acceptable within a library so the social norms also matters in design (Benyon, 2005).

Organizational context
Organizational context is all about where you work. This means that you do your activities in different places, different times and so on. It also covers how technology changes communication and the way you work in an organization (Benyon, 2005).

3.3.4 Technologies

The last part of the PACT analysis is the technologies part. Technologies in the PACT analysis is divided into four different parts; *input, output, communication* and *content.* Interactive systems usually consist of hardware and software and the remake of input to some sort of output. Preece et al (2007) talks about CMC, computer-aided communication, for people to

collaborate and communicate with. Examples of such technology might be videophones, videoconferencing, media spaces VoIP (voice over IP) and many others. Technology can perform various tasks, contain data and information. The aesthetics and style varies from designer to designer and also the way the technology is supposed to work. Technology is just a medium for the designers to work with (Benyon, 2005). The four main part as mentioned is the four main characteristics that needs to be considered.

Input

When talking about input devices the way the users enter data and instructions is what is meant. There are different kind of data that could be entered, like for instance text and barcodes. The characteristics of the data are what are determined what input device is needed. For instance bar codes only make sense if the data does not change that frequently. If you look in supermarkets at the vegetable section you often see a touch screen to get your price and that is good as an input device if you only have a few options to choose from. If using speech as an input device you need to make sure that there are no sounds in the background which will make it harder for the device to accept information (Benyon, 2005). For instance your mobile phone can make a call by you just saying the person's name. This requires that there is no background noise since it then gets harder for the input device to understand the commands given. Rosson & Carroll (2002) also mentions input devices such as buttons, trackballs, joysticks and data gloves. Trackballs, joysticks and data gloves are mostly used in the gaming industry.

Output

After having considered what input methods are to be used, just as important are the output devices. The different characteristics of the displays need to be considered. There is something called "streamy outputs" which is good for things like video, music and speech which is very different from how "chunky media" like icons, photos and texts. The difference between the two outputs is that streamy media probably won't stay around for long. However the chunky media can be read or seen over and over again. Streamy media like video you have to remember, otherwise you need to see it again (Benyon, 2005).

Figure 8. Examples of "Streamy Media"

Communication

The communication in technologies refers to how people communicate with devices. Communication includes things like bandwidth and speed. Equally important is how the system communicates back to the people. People need to see what is going on and if something is happening. If giving another example when transferring data to domain like YouTube the storage capacity is naturally also an issue since videos often require large amounts of storage space (Benyon, 2005). One way of showing users what is happening is for instance when they get error messages. Nielsen (2000) speaks of “good error messages”. Basically they should follow four simple rules; phrased in clear language so there is no risk of misinterpretation and also avoid messages that can be cryptic. The messages should not be vague or general. They should be written in a manner that will help the users to rectify their problems. Finally the massages should be polite. He also means that the system should continuously inform the user what it is doing (Nielsen, 2003).

Content

The content concerns the form that the data in the system takes. The way that people wants to see content is that it is up-to-date, accurate and presented in a good manner. People do not care about fancy retrieval of data no matter how nice it looks if the data is out-of-date and inaccurate. Some systems are more about content, like health care systems, and other systems are more about function like a remote control but most technologies are a combination of content and function (Benyon, 2005).

4 EMPIRICAL STUDY

In this chapter I will conduct the empirical part of the thesis, which will be made with own observations, interviews and scenarios. The interview will be conducted with someone that has been an active part in developing 1177.se.

4.1 Own Observations

When having made my own observations I have looked at the health care system from a PACT perspective. To be able to focus on the different PACT-aspect I started making an overview, in the form of a table, of what different areas that PACT covers. By doing so I will get the opportunity to check the P:s, A:s, C:s and the T:s of the analysis. The tables is divided into the four categories People, Activities, Contexts and Technologies. Figure 8 is what 1177.se looks like.

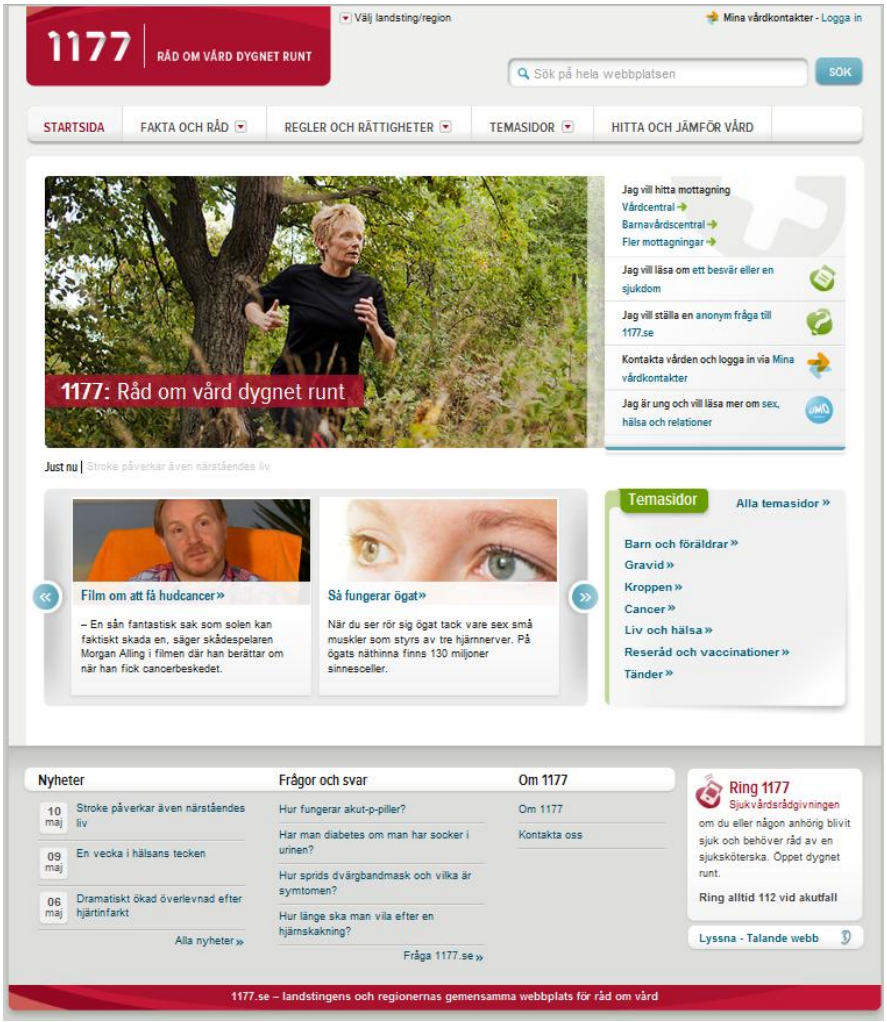
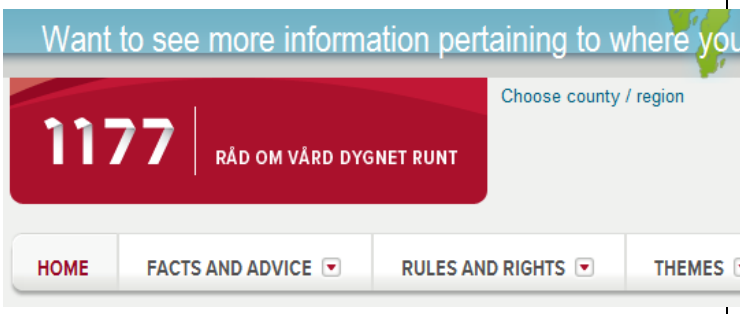


Figure 8 shows what 1177.se looks like

4.1.1 People

Physical differences	Physical differences cover height and weight, and also personalities, cognitive skills and preferences. When observing the health care system I can imagine that every type of person is a potential visitor. All kinds of people require some sort of information about health care. Since 1177.se is a health care system I see no need to change the health care system to make it look any different from people with different weights or heights. This is something that needs to be taken care of by the user, like for instance that the chair is high enough to see the screen. Other physical differences might be hearing and sight. 1177.se has taken into account the population with poor eye sight. They use a technology called "Browsealoud" which is a client that is downloaded to the user's computer and installed. After installed the information is read to the user. Figure 9 shows what the download instructions look like on 1177.se. There is also a manual on the health care system for explaining what to do to use to software.  *Figure 9 Browsealoud talking web on 1177.se* The health care system is built with contrast which makes it easier for people with bad eye sight to also get information. There is however no way to increase size of fonts, change fonts or change to a different font.
Psychological differences	When it comes to physiological differences there are people with more logic then others and some people have it much easier finding their way around. The structure of the health care system 1177.se I have noticed there are different ways of

	finding information and that the information areas are chunked so you can choose the way you get the information. The designers seem to have missed one crucial part if the health care system is meant for all citizens in Sweden, namely language barriers. The health care system is only a one language health care system and is not possible to change language. Wikipedia states that around 85% of the citizens of Sweden are born in Sweden, which means that 15% of the population may not speak Swedish fluently and might then miss out or misinterpret information published (Wikipedia, 2011). Minority languages like Finish, Romani, Yiddish and Sami are overlooked. Immigrants are also missing out on health care e-services. I tried using Google translate on 1177.se and saw that the website is easily translated from Swedish into English, except for the images with text in them. Figure 10 shows a translated version of 1177.se via Google translates.  *Figure 10 translated 1177.se by Google translate* The only languages that I was not able to translate to were the minority languages except for Finish.
Usage differences	Usage differences cover the area of how people interact with something. People with more experience in using technology usually find information faster and novice users might need more help. From what I can see on the health care system there are many ways to find the same information. You can search, browse or find directly on the first page. They have also mentioned that you can call to get help. I found 3

	ways in finding contact information to the county I live in which is the Kalmar county. I do not find any explanatory text when I hover the mouse over the headlines. Many health care systems use this to give even more information. I see that the there is no easy way to find your way back when you have visited a page. Some health care systems use “bredbcrumbs” for this which means that you leave a trail on how to get back. Usually this is located under the top menu. Figure 11 shows an example what a breadcrumb could look like.  *Figure 11. Example of a breadcrumb* The idea behind a breadcrumb is to click on for instance “catalog” and you get back to that area of the health care system. I notice that the health care system uses a lot of pull downs which makes it possible to find almost all the information right on the first page. There is then no need to search if you can dig down into the different pull downs. 1177.se has a button that refers back to the first page. When clicking on it you get to the first page and can then start over again.

4.1.2 Activities

Temporal aspects	Temporal aspects cover the area of how frequent certain activities are performed. Since 1177.se is a health care system that covers all different types of information regarding health care there is no way of saying that only sick people will visit the health care system. People who are about to travel, parents, pregnant women, and people with teeth problems are some of the different people visiting to get information. This probably means that the reason for visiting has increased. I base this on that in different aspects of life you might need different information. The more then health care system grows with information, the more likely it is to get people to visit. Since temporal aspects also cover time pressure I can see nothing else that can be changed on the health

	care system. The database questions, the searches and the surfing on the health care system are relatively fast, which means all response times are within a time limit that should be considered to be sufficient to wait.
Co-operation	I see that to get information from this health care system there is no need to co-operate with anyone unless the person has very poor eye sight. The person might then need help to finding the tools to work with, like for instance browsealoud. There is no live contact via 1177.se so no activities are performed simultaneously as in telemedicine.
Complexity	Since the main page is so informative and all information is very close at hand I see no direct risks with the tasks being not well defined. The health care system is very basic and has no extraordinary information that might be misleading. Nothing, like commercials, disturbs finding information.
Security critical	I see no obvious security risks here in someone getting injured or even worse losing a life. The only risk I see is that the more integrated the health care system becomes with e-services and health care that security critical systems are integrated with the health care system. However as the health care system is built up right now I see no apparent risks.
The nature of the content	The nature of the content covers what activities are made and if you have supporting technology for it. On 1177.se I see that there are ways of contacting and searching that requires certain technology. In those two cases you have e-mail, searching and booking times. In those cases a keyboard and phone is sufficient.

4.1.3 Contexts

Social context	From making own observations I have seen that a computer can be used almost anywhere nowadays since the introduction of laptops, Ipads and other devices which makes it possible to be almost anywhere in the world and still use the Internet and, particularly in this case, 1177.se.

	When I have used 1177.se I have every time been in a home environment, but still both outdoors and indoors. Basically privacy issues have a little to do with where the person is when using 1177.se. There are however no sensitive information on 1177.se as of today. No loud music, now slashing images that could disturb the environment is seen either. The only time the health care system makes sounds is when the software “Browsealoud” is used, since the text is then read to the people with poor eye sight. When looking at the health care system I noticed myself looking to see that no one else was in the proximity. I noticed that I had a sort of built in privacy issue. With that I mean that I do not want others to see what I was reading about on the health care system, sort of like a built in privacy mechanism.
Organizational context	The activities in can be executed in both the workplace and at home. When traveling you might also want to access the health care system from where you are located abroad or in the country. The difference I can see is that different people access the health care system in different times, depending on when they have some free time. People can access the health care system on all hours of the day. That means that the site can be accessed both at work and at home and when conducting a hobby.
Physical environment	The environment where the activities take place can be either indoors or outdoors. There are different aspects from what I can see when saying either outdoors or indoors. It is a difference in being outdoors in a warm country or in a cold country. Also indoors there are different temperatures and different lights. In the extreme a person might also be under water or up on a high mountain. All of these aspects need to be considered if a health care system should be accessible to most of the population. Making own observations however I think a more general point of view, like indoors and outdoors, is the only thing that needs to be taken into consideration.

4.1.4 Technologies

Input	Since text is the only thing that can be entered on the health care system when for instance logging in, doing searches, contacting 1177.se I see it as very important that the health care system supports the use of keyboards. There are of course also aids that translate voice into text and since those technologies has basically the same idea as a keyboard. I see no need for supporting hand scanners that scans barcodes. I see also that touchscreens are not supported unless you have a keyboard attached to it. Important when using a device that translates words into text is that there are no disturbing sounds around, since then there might be problems in translating the words.
Output	Output devices are different kinds of displays that need to be taken into consideration. One apparent display is the computer screen which has different sizes. Since a health care system is not a “streamy media” “sound displays” does not need to be taken into consideration. 1177.se is a chunky media which means that it looks the same from when you start looking at it to when you stop. A streaming media you have to remember. The different kinds of displays I can think of are computer screens and tv-screens.
Communication	Communication refers not only to how people communicate with the devices but also how the system communicates back to the population. The communication of how people communicate with the system is a lot about bandwidth. Here I see that not much bandwidth is needed since the health care system has no heavy-loading information. To help the users it might be good to optimize databases and not to have to large graphics. When loading pages on 1177.se I can see that response times are very fast, both on a regular broadband (8 mbit) and also with 3g. A 3g modem was used on a laptop to see responses. I have tried to find messages from the system when conducting a task. The only time I manage

	to find a little longer response time is when I search. However the response is too quick for it to make any sense to put a message there.
Content	The content of the health care system is mostly timeless since it is health care advice, but they have also managed to put current information into the health care system. The administrators also date the news so the population can see which dates the health care system is updated.

4.2 Interview

In this interview with Emma Lenneståhl I have tried to divide the questions up in the four different blocks to see which Ps, As, Cs and Ts that Inera, the company, has thought of when designing the Swedish health care system 1177.se. The questions can be found in appendix a.

4.2.1 People

Physical differences	1177.se is adapted so that users can use browseloud, which is a software that “reads” the text on the health care system for those who have a problem in reading. For those who cannot hear there is no problem since there are no streamy media on the health care system. No considerations have been taken to whether or not the person is tall, short, slim or big.
Psychological differences	To make it easier for all sorts of users to adapt the health care system you can both search for information, but also browse for them. This means logical and non-logical users can all get as much as possible out of their visit. The only language so far is Swedish.
Usage differences	Since we have tried to make the health care system as easy as possible for as many users as possible both experienced and

	novice users can appreciate their visit. The information is chunked, the information can be found either via searching or browsing. In worst case they can always call and get help that way.

4.2.2 Activities

Temporal aspects	The response time from the system is not anything that has been considered in the design of the health care system. Whether or not the users are under time pressure has not been in focus.
Co-operation	Much thought have been taken into account to make the health care system as easy to use as possible for all users. If the users cannot find their way a phone number is displayed so a regular phone can be used as well to get help.
Complexity	Much thought has been put in to the work of the health care system to make every action easy for everyone. Explanatory texts are present where action is needed by the users.
Security critical	The only information on the system is user information. So far there are no journals posted and no plans for that are made.
The nature of the content	The only way that user can communicate with the system is via keyboard, phone keyboard and virtual keyboard. Output devices are some sort of screen, whether it is a TV, projector, monitor or screens, like phone screens.

4.2.3 Contexts

Social context	No considerations have been taken whether a person is indoor or

	outdoor. However that health care system is highly contrasted so images and text are clearly visible in any environment.
Organizational context	There is a “frequently asked questions”-area on the health care system that anyone can read. There is also help texts in how you can ask your own questions and how the service works. There are small explanatory texts on each part, like for instance the search function there is a text saying “search the entire system” and so on.
Physical circumstances	No considerations have been taken whether a person is indoor or outdoor. However that health care system is highly contrasted so images and text are clearly visible in any environment.

4.2.4 Technologies

Input	The devices needed could be keyboards, mice or even touchpads if using new technology such as smartphones or for instance Ipads.
Output	This could be either computer monitors, smartphone screens or televisions. The health care system can also be shown on bigger movie screens but this is not anything that will be frequent and is not taken into account.
Communication	All images on the health care system are optimized and smell in size. Bandwidth related issues are why all images are optimized. There are no “while waiting” message however there are messages when for instance a search is done and what to do. When doing a search the health care system talks back in giving responses on the query.

Content	The content on respective county area is updated by people in that particular region. General information is updated centrally. The information is presented in such a way that it is easy to read and comprehend.

4.3 Scenarios

In two scenarios, described below, I attempt to develop a coherent, comprehensive view of the subject from the perspective of those who are being researched. I consider there are might be two main target groups which needs are perfectly met by the health care system. These two groups are 1) elderly people, who have adapted to new techniques and are eager to find information themselves, and 2) families with children, especially those that have a far to drive to a medical clinic.

The following structure of scenarios is presented in the later parts of the thesis:

- User group and a specific user
- Background
- Rationale
- Challenges

4.3.1 Scenario number 1

User group: Elderly people
User: 65-years old man, living in a small town in Sweden

Background

1177.se is a way for the Swedish citizens to find information that is related to health, health care and dental care. Since it was launched in 2010 it has been developed so that the users can interact with the health care system. For instance they can log in to the system and schedule appointment, finding related health information and also finding their local health centre. As time goes the system will evolve even more and more services will probably be offered to the users. This way more people can stay at home and handle their “health lives” in the comfort of their own homes. This is particularly good for the elderly who may live a longer time at home since monitoring and telemedicine might be the next step in the evolution of the system.

Victor Papanek (1985) pointed out the designers' responsibilities with respect to major social and environmental needs. Design for social well-being describes a very broad agenda for positive social change undertaken by various design disciplines including industrial design. Its primary concern is improving human social and economic conditions.

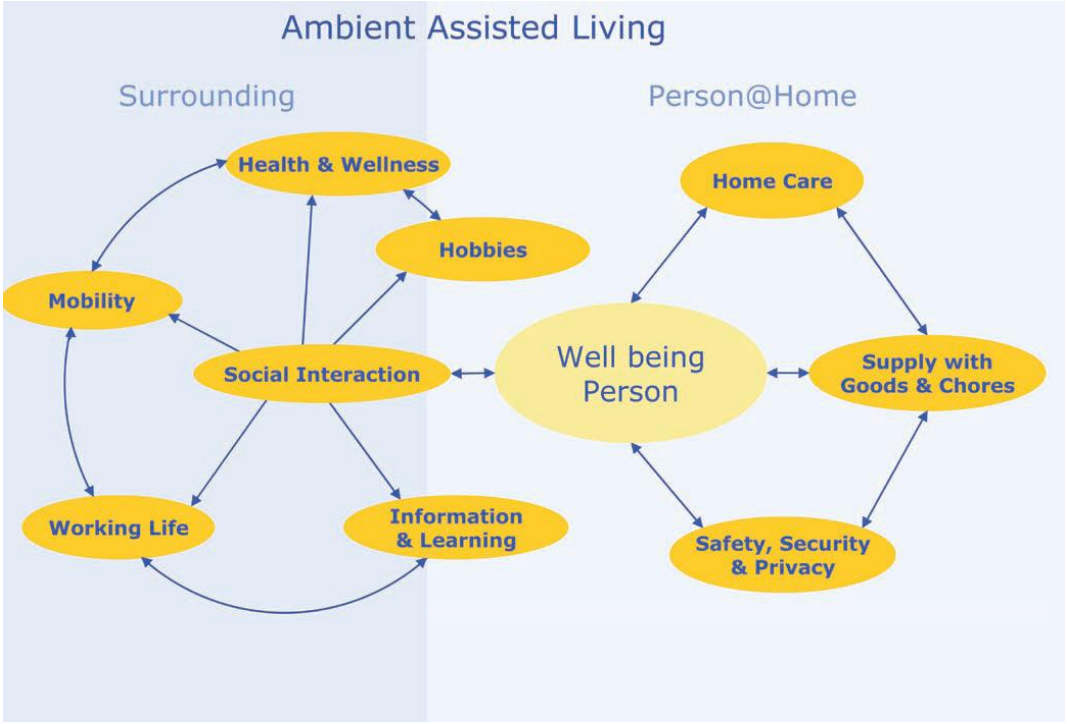


Figure 12. A multi-factor model displaying the needs of (elderly) persons for continued well-being (ICT enabled independent living for elderly

The high growth rate of elder population will have a significant impact on health services. In elder period elderly could be easily infected by diseases such as high blood pressure, diabetes, heart problems or overweight, among other diseases. It is very difficult for aged people to visit doctors daily and to have daily treatment and monitoring.

Rationale

Elder population is gradually increasing in the world. In 2020, the person over the age of 65 is expected to become 20% of the European population.

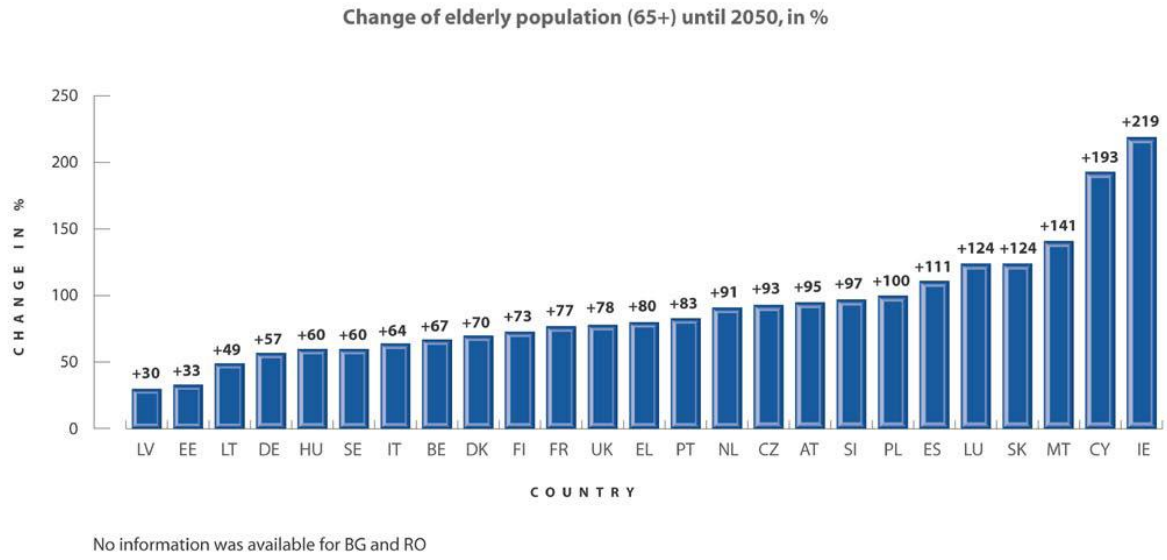


Figure 13. Changes of elderly population (65+) in EU-27 until 2050 (estimation, in %) (European Commission: Special Report No 1: The impact of aging on public expenditure: projections for the EU25 Member States on pensions, healthcare, long-term care, education and unemployment transfers (2004 -50). Report prepared by the Economic Policy Committee and the European Commission (DG ECFIN). Page 30. Data on Bulgaria and Romania has been added on the basis of current numbers to be found on the website of Eurostat (http://ec.europa.eu/eurostat))

According to the Eurostat statistical data, elderly population is more at risk of poverty and social exclusion. Age period from 50 to 64 years and over 75 years are of the biggest risk:

GEO European Union (25 countries)

AGE / TIME	2008	2007	2006	2005
From 25 to 49 years	19,5	20,0	21,0	21,2
From 50 to 64 years	23,6	24,7	25,4	25,9
From 65 to 74 years	19,5	20,2	20,0	21,0
75 years or over	24,2	25,6	26,2	26,5

Figure 14. Population at risk of poverty or social exclusion by age (http://ec.europa.eu/eurostat)

Among this age group females are more at risk than males:

GEO European Union (25 countries)

AGE	SEX/TIME	2008	2007	2006	2005
From 25 to 49 years	Males	18,6	19	20,2	20,6

	Females	20,3	20,9	21,7	21,7
From 50 to 64 years	Males	20,9	21,8	22,7	23,1
	Females	26,1	27,5	28	28,5
From 65 to 74 years	Males	16,9	17	17	17,7
	Females	21,8	22,9	22,4	23,8
75 years or over	Males	19,8	21,4	21,7	22,4
	Females	*27,1*	*28,4*	*29*	*29*

Figure 15. Population at risk of poverty or social exclusion by age and gender (http://ec.europa.eu/eurostat)

To face the demographic change, society has to improve healthcare for elderly people. Health care at home will see major changes especially in the field of prevention and monitoring, as these are drivers for cost reduction in the health system while at the same time they help improving the quality of life for elderly people.

Challenges

On a technological level**:** Integration of devices with enterprise software while providing availability.
It is also important to pay additional attention to the user interface, adopted for the elderly people and point out that elderly people more often have loss of visual acuity, reduced field of vision, worse perception of colours and depth perception, slower adaptation to changing light levels and different sensitivity to light. Additional attention should also be paid to usability and such factors as learnability, high productivity, memorability, low error rates and users' satisfaction.

On a business process level: Coordination (orchestration) of the different workflows of the involved stakeholders (doctors, nurses, etc.); furthermore, provision of a secure access to a potentially distributed patient record.

On a management level: Collaboration of different public and private institutions with different responsibilities across boundaries; in particular public institutions belong to different administrative areas (local, regional, national and European) with usually different regulations

On the compliance level: Compliance with privacy and security rules as, for instance, posed by the US Congress enacted Health Insurance Portability and Accountability Act (HIPAA), which, in the context of this scenario, particularly addresses health care providers.

One of the main challenges, however, is the possibility to reduce the digital divide between elderly and young people. There is a particular danger of exclusion of elderly people from new communication technologies and services as the fundamental values of the language of ICTs are essentially those that are associated with the world of youth (Breton et al. 1999). Measuring the Information Society shows that older Europeans (55 years and older) are particularly resistant to having an Internet connection (and PC) at home (INRA (Europe) 2000). However, in the light of the need for an "older workforce" (Institute for Prospective Technological Studies 2000) in the future, a "digital age divide" must be prevented, by providing telemedicine services and applications (such as online exams) with elderly-friendly user interfaces, public Internet access points and computer literacy training to increase the skills of elderly people. Data security and protection of privacy are also especially important in this context.

4.3.1.1 People

Physical differences	He is about 5ft, 2 inches tall and weighs around 65 kg. Apart from indulging in household chores, he also has a farm where he harvests wheat.
Psychological differences	He is very serious about the well-being of his family but is careless about his health. He thinks that his well-being lies in the well-being of his family members.
Usage differences	Being less literate he has no idea of what diabetes is about, diabetes self-management, diet-control for diabetes related exercises and is completely dependent on the infrequent visits of the village doctor.

4.3.1.2 Activities

Temporal aspects	Anders Johansson should visit doctor at least once a month for the check-up, monitoring and treatment of diabetes. Due to the poor financial condition of his family he is unable to afford the cost of the treatment. Blood glucose monitoring, maintaining logs for daily diet are

	continuous activities. Also the self-service machine should function continuously, without halt to accommodate the high number of patients.
Co-operation	Getting answers from doctors or nurses when asking a question about a disease he is interested in requires a co-operation between doctor/nurse and user. Scheduling a time with a doctor is entirely made by user and system. You can also call by phone and then a skilled phone operator gives accurate information if the user or person interested in some information does not have the knowledge to search through the health care system.
Complexity	The system is moderately complex for rural population and does not need external assistance for operating it.
Security critical	Some of the information of the system is security critical such as user information. Some of the information is open to the public, all the areas which contain patient critical information needs to be secured and the procedures should be in compliance with the medical standards. There should be no errors at all as health of the user is in question.
The nature of the content	The content involves user information, patient information and logs over visits to different health care centers. The content is also open information where you can read about different diseases, how you can get in contact with local health care. Information is divided into themes and can be accessed both by searching and browsing.

4.3.1.3 Contexts

Social context	Since 1177.se is a self-service portal, the interaction involves only one user at a time, but cooperation may be required between users, clinic staff and helpdesk personnel.
Organizational context	The Government has to set up a public-private partnership for providing infrastructure for setting up the system. The self-service portal, which is the same for everyone who uses it, will provide the patient information to the county level medical clinics. The patient information from all the counties of the country is going to be stored on secured central servers.
Physical circumstances	The entire system is a service that can be accessed from both from an indoor and outdoor environment. Any external disturbances like heavy wind, sound etc., should be prevented as it may affect the interaction between user and the system.

4.3.1.4 Technologies

Input	A keyboard and a mouse are the two input devices needed to interact with the system. A smartcard of the user for logging in to “my health contacts” and scheduling meetings is required.
Output	A monitor is the output device needed to get information presented, which is this case needs icons and text to be bigger.
Communication	Communication takes place both at the health care system and also at the clinic as a result of the interaction in the system. For emergency

	situations or complications district level hospitals may communicate directly with the user.
Content	All the content should be secure and foolproof, should be in compliance with privacy rules and regulations. The information should also be appropriate and correct.

4.3.2 Scenario number 2

User group: Families with children
User: Mother with 2 children

Background

Children are different than adults in that a child's brain develops more rapidly. Any problems a child may experience with his or her developing brain might be of subject for further information that can be found on 1177.se. For instance vision may disrupt the development of visual pathways to the brain, that‘s why children's vision care is essential to every child's development. Experts say that over 80 % of what a child learns in school is presented visually, so making sure a child has good vision can make a big difference in his or her academic performance.

Also the child might experience a lot of problems with their milk teeth since those are not as strong as the teeth they get next that will hold for the rest of their lives hopefully. Information regarding dental care is also something that would be good to find for this mother of two children since she might not have the time or the money to go to the nearest dental clinic for help.

This is a way for a child to easily see a doctor who may be hours away. A nurse helps the child and family while allowing doctors and other health care providers to talk to a parent and child about health concerns, to answer questions, to make recommendations for a plan of care, or follow-up on past care.

Rationale

Many parents do not have access to all the information they need to care for their children, especially when they live far from providers. 1177.se can bring

health care a lot closer to the mothers home and bring learning tools or at least information right to the comfort of their own home.

Challenges

On a technological level**:** Ensure access to affordable broadband for rural and underserved communities. These efforts should make the health needs of low income and underserved children a priority.

Extend 1177.se so that parents, teachers and other adults in contact with the children to get in contact with health care online where they are located**.** The opportunities to extend 1177.se to schools, child care centres, and other sites where underserved children are frequent should be explored.

On a business process level: Collaboration of different public and private institutions with different responsibilities across boundaries; in particular public institutions belong to different administrative areas (local, regional and national) with different regulations.

On a management level: Explore solutions to legal and bureaucratic barriers to extending 1177.se while ensuring patient safety and high health care quality are maintained.

On the compliance level: Clarify and standardize current laws to be able to extend 1177.se.

4.3.2.1 People

Physical differences	She is about 5ft, 2 inches tall and weighs around 48 kg. Apart from indulging in household chores, she works as a cleaning lady. She is a single mom. Her two children are 4 and 6 years old.
Psychological differences	She is very serious about the well-being of her family but do not have enough funds to always drive the children to dentists, doctors and so on.
Usage differences	She is well-equipped to handle everything that has to do with the Internet and has no problem in finding relevant information. She is however not fit to decide about a

	diagnosis for her children so she needs to be able to have a lot of information regarding children and what different diseases that they usually get and how to diagnose them.

4.3.2.2 Activities

Temporal aspects	Anna Jansson has been asked to take her children for a checkup at least twice a year and also to go to the dentist at least once a year with each child. Due to the poor financial condition of her family she is unable to afford the costly trips to the nearest health care clinic which is over 50 kilometers away from their apartment.
Co-operation	Getting answers from doctors or nurses when asking a question about a disease she is interested in requires a co-operation between doctor/nurse and mother. Scheduling a time with a doctor is entirely made by user and system. You can also call by phone and then a skilled phone operator gives accurate information if the user or person interested in some information does not have the knowledge to search through the health care system.
Complexity	The system is not complex at all for Linn, but she wants to find a lot of accurate, up-to-date information.
Security critical	The information that Linn is searching for is not patient critical, but she wants to be able to schedule appointments for her children via 1177.se. She would also like to see her children’s journals to keep track of what diseases they have has and not. That means that the user

	information is security critical. Most of the information is open to the public, but all the areas which contain patient critical information needs to be secured and the procedures should be in compliance with the medical standards.
The nature of the content	The content involves user information, patient information and logs over visits to different health care centers. The content is also open information where you can read about different diseases, how you can get in contact with local health care. Information is divided into themes and can be accessed both by searching and browsing.

4.3.2.3 Contexts

Social context	Since 1177.se is a self-service portal, the interaction involves only one user at a time, but cooperation may be required between users, clinic staff and helpdesk personnel.
Organizational context	The Government has to set up a public-private partnership for providing infrastructure for setting up the system. The self-service portal, which is the same for everyone who uses it, will provide the patient information to the county level medical clinics. The patient information from all the counties of the country is going to be stored on secured central servers.
Physical circumstances	The entire system is a service that can be accessed from both from an indoor and outdoor environment. However Linn only has a stationary computer which is located indoor. Any external disturbances like sound etc. should be prevented as it may

	affect the interaction between user and the system.

4.3.2.4 Technologies

Input	A keyboard and a mouse are the two input devices needed to interact with the system. A smartcard of the user for logging in to “my health contacts” and scheduling meetings is required.
Output	A monitor is the output device needed to get information presented.
Communication	Communication takes place both at the health care system via mail and also at the clinic as a result of the interaction in the system.
Content	All the content should be secure and foolproof, should be in compliance with privacy rules and regulations. It should also be appropriate and correct.

Self-service portals in health care can play a major role to provide much needed health care in remote areas. With proper coordination between local health centers and district level administration; this system could work to alleviate the health of rural people. I believe that the PACT methodology used in this research illustrates vividly for system designers a fuller range of requirements than other software design methods.

5 ANALYSIS & DISCUSSION

In this chapter I will analyze the empirical work compared to the empirical one. I will also discuss my findings.

5.1 People

Physical differences	Looking at the theory they mean that since people have different characteristics where it comes to the different senses; sight, hearing, taste, smell, touch and smell (Benyon, 2005). Nielsen (1993) also supports knowing the users; otherwise the system will not be usable to a wide range of people. When looking at the empirical part and one can see that some people have disabilities such as hearing and seeing impaired. When making the observations I see that size and contrast cannot be changed by the users is they have poor eyesight.
Psychological differences	The theory states that people differ when it comes to psychological parts, in for instance that some people are more logical then others (Benyon, 2005). Benyon also states that language is also a factor when it comes to physiological differences. Nielsen (1993) also points out the importance of knowing the user, which could for instance be which language the people speak. When looking at the empirical part and the scenarios it is not certain that any of them speak fluent Swedish and in the observations there is no way of changing the language to another.
Usage differences	Benyon (2005) point out that different users use systems in different ways, depending on the experience. Novice

	users and experienced users use systems in different ways. If a novice user finds the system too difficult, he or she will just leave. Nielsen (1993) once again states the importance of knowing the user and Krug (2006) points out the importance of not letting the users think. The interview, observation and the scenarios all point towards that the system is easy to use and no matter what kind of user you are, you can still browse and search in any way they like.

5.2 Activities

Temporal aspects	Temporal aspects, according to Benyon (2005), covers time aspects in that the system should deliver quick responses in order not to let people with time pressure wait. Also information can be critical if there is an emergency. The data collection shows that the responses of the health care system is very fast and deliver responses within just a few seconds.
Co-operation	Co-operation has to do with if tasks can be performed without any help of anyone. If not, the help of others is necessary (Benyon, 2005). In the empirical part there has been no indication of that the tasks are hard to perform for either novice users or experienced ones.
Complexity	In both scenarios and the observations there is no problem for anyone to work the health care system and the tasks that can be performed have small explanatory texts. Benyon (2005) states that the tasks should be well defined in order for everyone to be able to complete them without the help of anyone.

Security critical	According to Benyon (2005) it is imperative that the designers have thought about what will happen if a user by mistake does something. By that it is meant that no accidents should happen that might endanger lives. When looking at the collected data no information can cause the lives of anyone. The information is open to everyone and users cannot change information.
The nature of the content	When speaking of the nature of the content it is meant that the activities should consider the data requirements (Benyon, 2005). The empirical part shows that data requirements only demands a keyboard and mouse to support the activities performed.

5.3 Contexts

Social context	Kaptelinin & Nardi (2006) states that two criteria's are to be met for interaction design; rich enough to capture most use of technology and that the system is descriptive enough to make it easy to use. Benyon (2005) points out if tasks can be performed by ever one by the use of help texts or manuals. Doing the interview and by observing the system one can see that there are small explanatory texts for most things, but no manual for how to work the system or how the system is built.
Organizational context	Theory states that if working in different time zones, different places at different times that the activities will differ depending on what time and place you work (Benyon, 2005). Theory shows that the health care system is a 24-hour a day service

	and the actions can be performed at any time and any place.
Physical circumstances	When it comes to the physical environment, Benyon (2005) points out that there are might be a difference if the user is indoors, outdoors and if outdoors if the sun is shining and similar factors. The empery shows that users are using computers indoors and even if used outdoors, the health care system is highly contrasted and will still be able to use.

5.4 Technologies

Input	After having reviewed the interview, the scenarios and the observations, the way to interact with the health care system is to use a mouse and a keyboard. In some cases, such as an IPad, a touchpad is used. The theory also supports the use of a keyboard and a mouse (Benyon, 2005, Rosson & Carroll, 2002), No tasks or actions requires the use of anything else such as bar code readers etc.
Output	Benyon (2005) points out the importance of both the input devices and output devices. In the case where video and streamy media is shown might require other output devices. However the empirical part does only suggest the use of monitors or televisions. The interview does not mention any use of other media, the scenarios describes the use of computers and the observations I have made also supports the belief that only monitors and televisions are needed as output devices.
Communication	Preece et. al (2007) mentions

	computer-aided communication where people communicate with the system. Nielsen (2000) speaks of good error messages. These various interactions with the system are the communication between the system and the user. In my own observations I can see that nowhere is the system communicating with the user. That takes away some feeling of the system being interactive and the users might get annoyed when having to wait for a long time without knowing what is going on.
Content	When looking at the empirical part and the scenarios it is very important to have all the information up-to-date and that the information on the system is correct since in both cases no interaction with a doctor is present. In the interview it is stated that information is controlled and updated regularly and in the theory part Benyon (2005) also point out the importance of updated and correct information.

6 CONCLUSION

In this chapter I will draw my conclusions from the analysis and also give suggestion to future research.

I will, as in the rest of this thesis divide the conclusions into the 4 different blocks that people, activities, contexts and technologies.

6.1 PACT analysis conclusion

6.1.1 People

Physical differences	A few minor improvements on the health care system when it comes to users for instance changing contrast and sizes of fonts themselves would improve this aspect considerably. That means that more emphasis can be put into the work of getting people with poor sight to work with the system.
Psychological differences	Improvements in meeting a wider range of users would be to expand the health care system to include more languages, since only 85% of the Swedish population is born in Sweden. The system is in other aspects of psychological differences well designed.
Usage differences	Since the health care system is well designed no reason for further development can be found. The system can be used by both experienced and inexperienced users.

6.1.2 Activities

Temporal aspects	The response times from the system is fast so even if the user works under time pressure the health care

	system is not increasing the stress. Also since the health care system is build both for experienced and inexperienced users and the simplicity of the system there will be no problem for frequent or non-frequent visitors.
Co-operation	There is no need for co-operation in this health care system since all of system is easily designed for the users.
Complexity	All tasks are well defined so all users from beginner to experienced ones can manage the health care system.
Security critical	No information on the system can hurt anyone if a mistake is made. Most information is open to everyone and no diagnosis is made on the system. When accessing user information a two-factor login is required which basically means you need an identification saying that the person logging in is really that person.
The nature of the content	The nature of the content basically only requires a keyboard and a mouse in order to interact with the system.

6.1.3 Contexts

Social context	Since no online help or manuals are present besides a “frequently asked questions” section that mostly covers diseases this is something that could increase the ease of use of the health care system.
Organizational context	No extra considerations needs to be taken depending on where the user works or at what times since it is an online service that is open 24 hours a day also the system is fast loading so bandwidth is no bigger issue.
Physical circumstances	No particular considerations need to

	be taken when it comes to the users being outdoor or indoor since the system from the start is contrasted when it comes to text, images and backgrounds.

6.1.4 Technologies

Input	The input devices that both theoretical and empirical part points out are keyboards and mice to interact with the system. A security card with two-way factor identification is something that is needed to interact with e-services. The more e-services that are developed the more need the user has to get a security card in order to get as much out of the system as possible.
Output	The only output devices that I can see that needs to be considered in the design are monitors, in different forms, and televisions.
Communication	Since the system is searchable maybe at times when there are many users on it, it could be wise to add “talk back”-messages while the user is waiting so that they do not think the system has halted, like for instance “loading page”.
Content	The information on the system is well-presented, however I think a process is needed where all the information is reviewed from time to time to see that it is still correct and relevant.

To conclude the thesis and looking at the original research questions I had which was how the design of the health care system 1177.se can be improved, what improvements can be made depending on the activities in the contexts and also which opportunities there are with the health care system.

Looking at the table the design can be improved by adding options for the

users to increase or decrease font sizes and also to change contrasts of the system. Also adding more languages in order to fulfill the needs of all residents living in Sweden would increase the ease of use of the system. Also there can be “talk back”-messages included when people are making queries so that they know what is happening while waiting.

I see the results from the scenarios, the interview and my own observations as being very similar since I think most people in Sweden have Internet access and also that our social system makes it possible for all Swedish citizens to be able to go to public places for the opportunity to get online and being able to access 1177.se.

Depending on what activities in what contexts are undertaken online help and manuals would be something that could benefit the users and in particular the ones that are novice users and is not a frequent user.

Opportunities, of a health care system like this can be quite big, since with a security card where you can identify yourself, doctors can start seeing users via, for instance, video conferencing.

In order to get more substantial personas it would have been better if an evaluation of the user statistics of 1177.se would have been made. This would make the evaluation of the personas even stronger and more substantial results could have been made.

I cannot help but to think about strengths versus weaknesses in using a PACT analysis. I think it is a major strength in using the analysis in an existing system, since then facts about how the system is used is already present. I think that a weakness in the PACT analysis is when there is no system present. I think that almost all results are then assumptions and no hard facts.

6.2 Suggestions for further research

In future work one can evaluate the output from my PACT analysis with a range of stakeholders such as medical professionals, patients, administrators of government and private health insurance, and with IT developers. In further research more statistics about the use of 1177.se should be made in order to get better personas suited for the situation to be able to better develop 1177.se in the future. Further research might also include workshops where people with disabilities and people from other origins then Sweden get to use the health care system in order to find more opportunities for the health care system to develop.

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APPENDIX

In this chapter I will present raw material that has been refined and used in the thesis.

Appendix A - Interview

People

1. Have you taken into consideration any physical differences when working with the design of 1177.se such as sight, hearing, sense, smell and taste?

2. When looking at the health care system I see that Swedish is the sole language that users can choose. Is there a reason why there are no more languages? Do you think the health care system is better for logical users or non-logical users, and why?

3. Have you, when designing the health care system taken into consideration if the user is a beginner using the Internet or experienced? If so, how?

Activities

1. When it comes to temporal aspects, for instance how frequent you think the health care system is visited, has any of those been taken into consideration, and if so, how? Temporal aspects also covers time pressure for the user, response times from the system.

2. Can the user perform all tasks without the help of anyone? Experienced? Novis?

3. Is every task that can be performed well-defined?

4. If an user does a mistake, is there a chance then that anyone could hurt themselves?

5. Has there been any thoughts about what inputs (devices) is needed by the user to be able to handle information on the health care system (keyboard, bar code reader, screen etc. etc.)

Context

1. At the point of design, were any considerations taken about the physical surroundings, such as indoor, outdoor, sunny, rainy where activities are performed?

2. Has any aids for the users to help them perform their tasks on 1177.se? Like manuals that can be printed or online help?

3. How did you discuss around the subject of where a person works? For instance what if they use the health care system during day or night, different places and so on?

Technologies

1. What are the input devices necessary for the user to enjoy the full potential of the health care system 1177.se? (For instance, mice, keyboards, bar code readers or something else)

2. Also when it comes to output, what are the devices necessary to take full potantial of the health care system?

3. About communication between the user and the system, has any design considerations been taken into account when it comes to bandwidth, how the system talks back while waiting for answers? Users often want some kind of feedback about what is happening, like for instance “loading page”.

4. When talking of the content of the health care system, how do you make sure that the information is up-to-date, that it is correct and that it is presented in a nice way?