Evaluation of a web-based portal for chronic diseases

A summative evaluation for application of the CeHRes Roadmap via a case-study and a literature scan

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1. PREFACE

Dear readers,

This is my thesis for the completion of my master study Health Sciences at the University of Twente. The road to this conclusion was quite tough and I am thankful to several people.

First of all, I would like to thank my family & friends. Your support and encouragement gave me strength to continue and (eventually) finish my thesis.

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At last, during my period in Canada I met some amazing people at the University of Waterloo and MedManager. Everybody who helped me, I am very grateful for your help and friendliness. But I want to thank some people in particular: Don Cowan, Michael Cowan, Joe Whitney and Shirley Fenton.

Enjoy reading.

Freek Hertman
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Content

2. ABSTRACT

Background:

More and more people suffer from chronic diseases such as Diabetes Mellitus (DM) and Chronic Obstructive Pulmonary Disease (COPD). Not only the amount of people suffering from these diseases increases, the costs of the care of these diseases is increasing significantly as well. Trying to help people cope with this problem, eHealth technologies try to explain the gap between care and costs by supporting people.

Objective:

In this study the urge of participatory development will be demonstrated for the development of an eHealth technology (eHt). This will be done via an empirical case study of a web-based portal pilot for patients suffering from Diabetes Mellitus type 2 combined with a literature study. The web-based portal of MedManager situated in Kitchener, Canada has been used as case-study. The development and implementation activities from the case study will be compared with the activities that should have been performed according to the first two phases of the CeHRes Roadmap. These are Contextual Inquiry and Value Specification. (van Gemert-Pijnen et al., 2011).

Methods:

Three different research methods have been used in this study.
- A stakeholder-analysis via an expert-group
- Interviews with stakeholders
- A non-systematic literature scan

The stakeholder analysis has shown the stakeholders who are important for an eHt such as this case-study. These stakeholders have been categorized according to the theory of Mitchell and Sharp et al (Mitchell, Agle, & Wood, 1997; Sharp, Finkelstein, & Galal, 1999).

The interviews were held with employees of MedManager. They were the developers of the eHt. One part of the interviews has been categorized to the principle of Eysenbach's article regarding the 10 e's of eHealth (Eysenbach, 2001). The other part of the interviews and the literature study was categorized to the principles of the HOT-FIT framework of Yusof et al (Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008).

Results:

Stakeholder approach: Different stakeholders have been found important by the expert group with different roles. The stakeholders are: GP/Diabetic nurse, Insurance Company, Government, Diabetes Education Center, Diabetes Association and the Industry.

E's of eHealth: When looking at the e's of eHealth, empowerment and ethics seem to deem the most importance from the interviewee whereas equity is least important.

HOT-FIT framework: The analysis of the HOT-FIT framework showed that the dimensions that effect the users directly seem to be the most important dimensions when comparing the information from the interviews and literature. These dimensions are Information Quality, Service Quality, System Use and User Satisfaction. Most relevant information was found about the use of an eHealth technology and the role of the user.

Conclusions:

When developing an eHealth application such as MedManager's portal, it is important to consider many aspects from the beginning. Using a stakeholder approach and thinking about several aspects such as 'the e's of eHealth' and the different dimensions from the 'HOT-FIT framework' might improve the quality by guiding the developers. Literature shows that a holistic way of working while developing an eHt would be the best approach. This case-study shows the possible pitfalls of the expert driven way of working. When neglecting dimensions such as organizational environment and net benefits the outcomes can be less positive.

3. INTRODUCTION

– 3.1 Background

- 3.1.1 eHealth technology for patients with a chronic disease

Since 1950, chronic diseases have become the main burden of disease for industrialized countries such as the USA and Canada (Leavitt, 2001). Illnesses as cardiovascular disease (CVD), chronic obstructive pulmonary disease (COPD), and diabetes account for 50%-60% of today's global mortality burden (Leavitt, 2001). Dealing with the problems that result from chronic disease require an integrated approach with a focus on risk factors (e.g. smoking, physical inactivity, an unhealthy diet) and combined treatment programs for chronic care patients (Mohammed & Yusof, 2012). EHealth offers opportunities to design an integrated approach in order to improve health care. EHealth is described by Eysenbach as:

'An emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology'(Eysenbach, 2001) .

EHealth technologies (eHts) for patients with chronic diseases are being developed in order to prevent, diminish and/or control chronic diseases. Yet, the uptake of eHts is lower than expected and the adherence is rather low so far (N. Nijland, van Gemert-Pijnen, Boer, Steehouder, & Seydel, 2008).

- 3.1.2 Challenges for the success of eHealth technology

Throughout the years, experience and research have shown that people tend to use web-based portals only for a short period of time. This phenomenon is called non-usage attrition. Many projects fail to survive beyond the pilot phase and studies that investigate the effectiveness of eHealth applications most often do not show any long-term effects. (Eysenbach, 2005; Kelders, Van Gemert-Pijnen, Werkman, Nijland, & Seydel, 2011; Nicol Nijland, van Gemert-Pijnen, Kelders, Brandenburg, & Seydel, 2011).
In general, three types of difficulties with the uptake of eHealth have emerged:
- Slow diffusion:
  the eHt is not available for, or desired by, everyone. Potential users do not have the resources (access), or the need, to use the technology (Van 't Riet, Crutzen, & De Vries, 2010).
- Low acceptance:
  the eHealth technology is not satisfying. eHt does not meet the needs of early adopters (van Gemert-Pijnen et al., 2011).
- Low adherence (or: non-usage attrition):
  the eHt is not used persistently (e.g. online therapy is not finished) (Fry & Neff, 2009).

- 3.1.3 Participatory development of eHealth technology

According to van Gemert et al. participatory development might form a solution to these uptake and adherence problems. During participatory development, the needs of stakeholders (including users) are identified, and taken into account during the design of the eHt (van Gemert-Pijnen et al., 2011). A stakeholder is defined as "any group or individual who can affect or is affected by the achievement of s the organization's objectives" (Catwell & Sheikh, 2009).

Stakeholders can be considered as actors that can have a role in the development of eHts, from ideation to operationalization. Through specifying critical issues for design and implementation, stakeholders can help to create and operationalize the technology (Carr, Howells, Chang, Hirji, & English, 2009; Freeman, 2004). Adequate project management needs to arrange the participation of stakeholders and identify their roles, tasks, and responsibilities.

The Center for eHealth Research and Disease Management (CeHRes) developed a framework that can be used for the planning, coordination and execution of a participatory development process of an eHealth technology. This framework is called the CeHRes Roadmap. The Roadmap consists of several stages of research and development.

- **3.2 Objective**

In this study the urge of participatory development in the development of an eHt will be demonstrated. This will be done via an empirical case study of a pilot web-based portal for patients with Diabetes Mellitus type 2 combined with a literature study. The development and implementation activities from the case study and literature scan will be compared with the activities that should have been performed according to the CeHRes Roadmap (van Gemert-Pijnen et al., 2011).

- **3.3 Case study**

MedManager is a company situated in Kitchener, Ontario, Canada that developed a portal and coaching program (Live Well Coaching) for people with chronic diseases, such as DM, COPD, Crohn's disease and cardiovascular diseases. The company's mission with the portal is:
'Live Well Coaching is dedicated to helping people living with or at risk of a chronic disease to have a healthy, fulfilling life. Our focus on quality, innovation and empathy ensures that we deliver the most effective and enriching wellness programs' (Medmanager, 2011).

This portal helps people to manage their disease. It lets clients enter a variety of biometric and lifestyle parameters (e.g. nutrition, blood glucose levels and medication) into a secured web-based portal. The front page can be seen in figure 1. A Health Care Provider (HCP) has access to an overview of the parameters; this means that the HCP is able to track its clients and to guide them handling their disease. The HCP sees the personal health record as can be seen in figure 2.

According to MedManager, the phenomenon of non-usage attrition mentioned in the introduction has also happened to their portal. They feel that users are not engaged enough to the portal. Users don't have enough incentives to come back to the portal and keep the same engagement to the portal (unpublished article, 2010). They think that users like the portal when they are actually using it on their pc but are not thinking about it anymore once they are offline.

Despite the promising ideas, the portal is no longer online. After being piloted, MedManager decided to stop with the portal due to various (unknown) reasons. This case-study focused on the pilot-version to see what improvements could be made improved hypothetically.

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Figure 1: Screenshot of the introduction page from MedManager's portal

Figure 2: Screenshot of the Personal Health Record page from MedManager's portal

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4. METHODS

– 4.1 Introduction Roadmap

In this study the roadmap that has been developed by the Center for eHealth Research and Disease Management (CeHRes), has been used to investigate to what extent the research & design activities are carried out or deemed important by the project management team of MedManager. The focus will be on the first two phases; Contextual inquiry and Value specification. This choice has been made because MedManager's portal was not yet finished according to the corresponding phases of the Roadmap.

The CeHRes roadmap can be used to plan, coordinate and execute the participatory development process of eHealth by working with a holistic approach. An important aspect of the framework is the fact that it is an iterative process, it never stops. After one phase, feedback can be given to an earlier stage of the process and can be adjusted right away (van Gemert-Pijnen et al., 2011).
The roadmaps consist of 5 phases, as can be seen in Figure 1. This study will only focus on the first two phases and explain what has been done in this research, but to give an overview the other phases will be mentioned as well.

Figure 3: CeHRes roadmap (van Gemert-Pijnen et al., 2011)
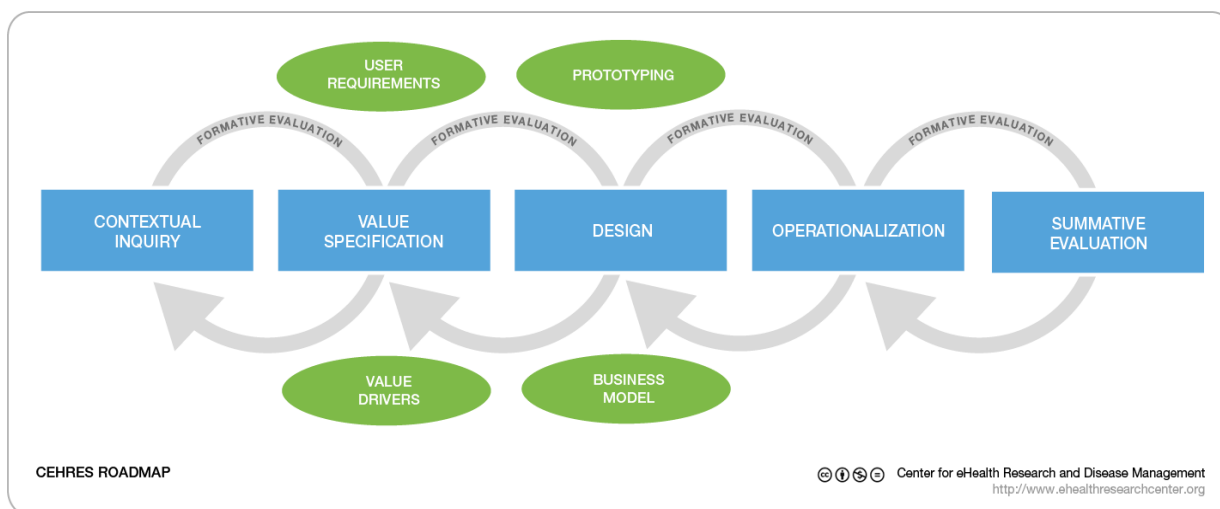
- 4.1.1 Contextual Inquiry

Contextual Inquiry deals with the gathering of information and getting to know the problem(s) in healthcare. This information incorporates all the intended users and the environment of the technology. Within this phase, field observations and interviews help to gather information about the needs and demands regarding healthcare and to see how technology can help to improve it (van Gemert-Pijnen et al., 2011). Via desk-research stakeholders can be identified. Their information will enhance the knowledge of the problems they experience in health care. After that, it is important to gather the solutions they suggest themselves, via e.g. focus groups (van Gemert-Pijnen et al., 2011).

- 4.1.2 Value Specification

The value specification phase uses the outcomes from the Contextual Inquiry phase. With these results, an exploration can be made to improve healthcare regarding economic, social and behavioral values (van Gemert-Pijnen et al., 2011). Values in this case are improvements that stakeholders want to realize in healthcare ("Key-stakeholders rank the values," 2011). This can be done by ranking the values of the needs and demands of the stakeholders. Limitations and possibilities from current health care are researched in this step as well. After this step, it should be clear what values are most important to incorporate in the eHt in order to succeed with a new technology (van Gemert-Pijnen et al., 2011).

- 4.1.3 Design

If the goals and needs are clear, a design can be made. Different techniques can be used in the design process (e.g. making mock ups and prototypes). The quality of the design has to be assessed at three different levels (DeLone & McLean, 2003):
- System quality: Technology that is user- friendly and safe to use
- Content quality: Content that is understandable, meaningful and persuasive
- Service quality: Service that is timely provided and persuasive

- 4.1.4 Operationalization

Operationalization is the process of implementing the new technology into daily practice. This process is difficult since there are many factors that threaten successful implementation. Such threats are for instance planning, adoption and education (van Gemert-Pijnen et al., 2011). Key stakeholders have to decide strategies and activities to operationalize the technology. Business modelling is an appropriate method to use in this step, it will steer the adoption process (van Limburg et al., 2011).

- 4.1.5 Summative evaluation

After the new technology has been implemented, analysis of its actual usage and benefit is needed. Both uptake and impact of the technology have to be measured and have to be compared to the goals set in the value specification phase to estimate their effect (van Gemert-Pijnen et al., 2011).

In order to be able to reach the objectives of this study (to compare actual research and development activities of MedManager to the activities that should be performed according to the CeHRes roadmap), several research methods have been used.
First of all a stakeholder analysis has been performed to evaluate the Contextual Inquiry activities from MedManager. Interviews were held with the chosen stakeholders and a literature study has been performed to complete the activities from the Value Specification phase.

- **4.2 Stakeholder analysis**
  - 4.2.1 Introduction Contextual Inquiry

According to Carr et al. stakeholders are all parties who are affected by a project (Carr et al., 2009). Their cooperation is crucial for the success of an eHt (van Gemert-Pijnen et al., 2011). There are many types of stakeholders for an eHt, such as patients, doctors and policymakers. Not all stakeholders all equally relevant or influential. The most relevant stakeholders are the so called key-stakeholders. Key-stakeholders are people or organizations who's effort are likely to contribute to the success of the eHt (Osterwalder & Pigneur, 2010). These have to be found to gather information for the Contextual Inquiry. According to the Mitchell typology, there are three values attributes important regarding stakeholders:

- Power: the power of a stakeholder to change the eHt; to what extent can someone say something about the eHt
- Legitimacy: the legitimacy of the stakeholder to the eHt; what rights does someone have within the eHt
- Urgency: the urgency of the stakeholder's claim of the eHt; the degree to which the stakeholder claims call for immediate attention (Mitchell et al., 1997)

If a stakeholder possesses one or more of these attributes his role will be different. Definitive stakeholder groups have power, legitimacy and urgency to have a great influence on the development process of the eHt or the eHt itself (Mitchell et al., 1997), therefore only definitive stakeholders have been included. A differentiation has been made regarding stakeholder groups. According to Sharp et al. there are four different types of stakeholders (Sharp et al., 1999):

- Users: user are people who interacted with the eHt and control it directly
- Developers: people who developed the eHt
- Legislators: organizations or people who produce guidelines for operation of an eHt
- Decision makers: those who make decisions about the eHt

The opinions from these stakeholders have been gathered about problems and solutions regarding current healthcare.

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- 4.2.2 Selection of Participants

In the search for stakeholders in this case study, expert opinions were gathered (Sharp et al., 1999). These experts were chosen by the researcher because of their experience in the field and their alignment with MedManager. Experts in this case were the vice-president of MedManager and a member from the board of advice of MedManager. Both the experts were asked in person if they wanted to cooperate with this research. At first, the researcher made a list of possible stakeholders according to the theory from Osterwalder and Pigneur and the Mitchell typology (Mitchell et al., 1997; Osterwalder & Pigneur, 2010). This list has been made by using knowledge from the researcher and by browsing on the internet for possible stakeholders regarding diabetic care in Canada.

After that, a first meeting was held with the experts together in one room. In this meeting, the possible stakeholders were brought up by the researcher and the experts gave their opinion based on their experience. After this meeting, the results were summarized by the researcher and a second meeting concluded the stakeholders that were important. Finally the stakeholders were categorized by the researcher.

- 4.2.3 Data analysis

All stakeholders that have been mentioned in the meetings by the experts have been compared with the literature from Mitchell et al. and Sharp et al. to tell what kind of stakeholders they are (Mitchell et al., 1997) (Sharp et al., 1999). This has been shown in a table to specify the different roles that these stakeholders have.

- **4.3 Interviews**
  - 4.3.1 Introduction Value Specification

After the stakeholders and key-stakeholders have been found, the next step in the CeHRes Roadmap is Value Specification. With the information that has been gathered in the Contextual Inquiry, an exploration can be made to improve healthcare and the eHt by adding value (van Gemert-Pijnen et al., 2011). In order to rank the information based upon their contributing values, the definition of value has to be mentioned first s. In literature, the following meanings of 'value' are given:

- The Oxford Dictionaries Online mentions: ' Value(s) = principles or standards of behavior; one's judgment of what is important in life' ("Value," 2013)
- Value proposition is an aggregation, or bundle, of benefits that a company offers customers. It solves a customer problem or satisfies a customer need (Osterwalder & Pigneur, 2010).

Based on these definitions and the interpretation from CeHRes, a definition of value is; 'A value = something that is beneficially and desirable for a stakeholder' ("Key-stakeholders rank the values," 2011).

To expand on this 'value' concept and to have a guideline for analysis, the articles 10 e's of eHealth and the HOT-FIT framework haven been used (Eysenbach, 2001; Yusof et al., 2008). Both articles show how according to their definitions, value can be added to an e-health application. Eysenbach shows 10 e's that can be seen as definitions of values and in the HOT-FIT framework the dimensions can be seen as values. Therefore these two articles are both used in the CeHRes roadmap (van Gemert-Pijnen et al., 2011).

Article number 1: *10 e's of eHealth*

Eysenbach's article is about the 10 e's of health in which these 10 e's represent what eHealth should stand for according to him (Eysenbach, 2001). All of these e's imply some kind of importance regarding eHealth and their stakeholders. Therefore the e's of eHealth from Eysenbach can be seen as values, since they manage to tell something about the beneficially and desirability for stakeholders. The e's represent the following values:

1. **Efficiency**
   Does the eHt increase efficiency and therefore decrease costs of health care?
2. **Enhancing Quality**
   Does the eHt enhance the quality of care?
3. **Evidence Based**
   Is it important that the eHt is evidence based?
4. **Empowerment**
   Does the eHt empower patients to take control of their disease?
5. **Encouragement**
   Does the eHt encourage a new relation between patient and HCP?
6. **Education**
   Does the eHt educate users?
7. **Enabling**
   Does the eHt enable information exchange and different ways of communication?
8. **Extending**
   Does the eHt extend the scope of healthcare beyond its conventional borders?
9. **Ethics**
   Is the eHt a threat to the ethics in care, e.g. privacy?
10. **Equity**
    Does the eHt decrease or increase the gap regarding equity in health care?

Article number 2: HOT-FIT framework

Another way to specify the values from the Value Specification phase from the Roadmap, is to describe the dimensions from the HOT-FIT framework as values as described earlier (Yusof et al., 2008). These dimensions also address the beneficially and desirability for stakeholders.

The HOT-Fit (**H**uman **O**rganization **T**echnology) framework describes how an Information System (IS) can be influenced and shows that all dimensions influence each other in a certain way. There are three essential components in this framework: Technology, Human and Organization. These components correspond to the following eight dimensions as can be seen in figure 4.

Figure 4: HOT- FIT framework (Yusof et al., 2008)
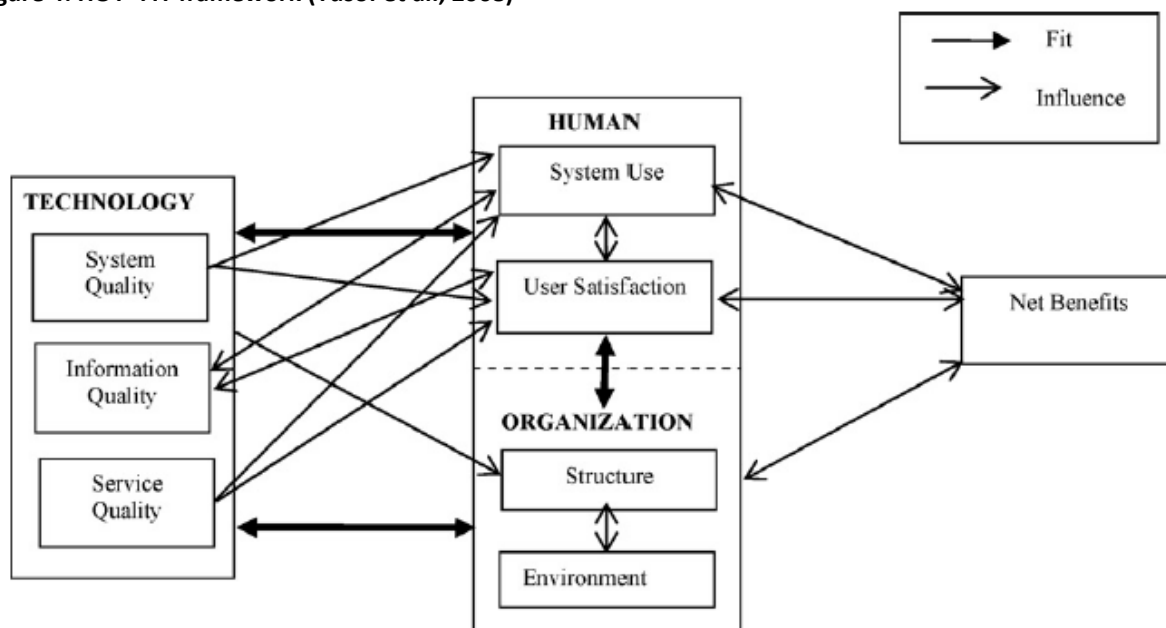
Technology:
- System Quality:
  measures the features from the technology including system performance and user interface. Examples of measures are: ease of use, reliability and security.
- Information Quality:
  measures the information that the technology produces. Examples of measures are: accuracy, and timeliness.
- Service Quality:
  measures the overall support delivery of the technology. Examples of measure are: assurance, empathy and quick responsiveness.

Human:
- System Use:
  measures the frequency of the technology being used. Examples of measures are: actual use of system, knowledge of users and expectations and resistant of users.
- User Satisfaction:
  measures the satisfaction from users by looking at the overall evaluation from user's experience. Examples of measures are: attitude towards technology and user's perceived usefulness.

Organization:
- organizational Structure:
  Measures the organization's structures by looking e.g. at the type of organization or size, autonomy.
- Organizational Environment:
  measures the environment of an organization by looking at e.g. its financing sources, the politic environment it is in and the population served.

Net Benefits:
measures the balance of positive and negative impact the technology has on its users. Users can be seen as stakeholders in this research. Examples of measures are: job effects, efficiency and error reduction.

All of these values and their importance are found by interviews with key stakeholders, a literature research and an evaluation that will be part of this research.

- 4.3.2 Participants

All chosen interviewee worked at MedManager, in total n was 6. Only employees from MedManager have been interviewed. One of the experts from the stakeholder analysis introduced the interviewee to the researcher. This strategy has been chosen to focus on a small part of the whole Roadmap and its stakeholders, trying to compare what MedManager could have done differently compared to the first two phases of the Roadmap.

Three types of definitive stakeholders have been interviewed according to the theory of Mitchell et al. and Sharp et al.: Decision makers, Users and Developers. (Mitchell, Agle et al. 1997; (Sharp et al., 1999))

- 4.3.3 Structure of interviews

The interviews lasted approximately 20 to 50 minutes and were semi-structured. They were held at the office of MedManager in a closed meeting room with the researcher and one interviewee at a time. All interviews were held on the same day. The interviews were recorded with a recording device. This was done to enable the interviewer to pay full attention on the interview. The following relevant questions have been asked, as can be seen in table 1. They were categorized to enable structured analysis.

Table 1: Questions asked during interviews

Questions	Category for analysis
1. Could you please introduce yourself?	Introduction / stakeholder analysis
2. What is your function within the company?	Introduction / stakeholder analysis
3. What is your relation with the portal/Live well coaching?	Introduction / stakeholder analysis
4. How do you like working with the program (in general)?	Introduction / stakeholder analysis
5. What do you feel could be added to the portal to improve it in any way?	Improvements (HOT-FIT)
6. Could you please give your importance with the portal regarding the following topics on a scale from 0 to 10? 1. Efficiency 2. Enhancing Quality 3. Evidence Based 4. Empowerment 5. Encouragement 6. Education 7. Enabling 8. Extending 9. Ethics 10. Equity	Improvements (Eysenbach 10 e's)
7. What do you believe is the best way to improve the engagement of the portal for the users?	Improvements (HOT-FIT)

- 4.3.4 Data Analysis

In the interviews, the following categories were important regarding the data analysis:

- Introduction / Stakeholder analysis
With this category, it was important to get to know who was interviewed and what their connection was with the eHt from MedManager. According to this information, the interviewee was placed in a stakeholder group by the researcher based on literature from Sharp et al (Sharp et al., 1999).

- Improvements: E's of eHealth and HOT FIT framework
E's of eHealth: The opinion of the interviewee that had been asked concerning the values of eHealth according to the e's of eHealth by Eysenbach (Eysenbach, 2001). In the interviews, a score was given on a scale from 0-10 (0 being not important and 10 being most important).
The scores of the individuals on the 10 e's have been added up and divided by the amount of answers given to make an average score. After that, a comparison was made. The highest average score was number 1 and the lowest score was number 10. With this information, a ranking of values decided which e's deem more importance according to the interviewee.
HOT- FIT framework: The answers of open-ended questions regarding improvements from the portal have been coded by the researcher to the different dimensions/values of the HOT-FIT framework mentioned earlier (Yusof et al., 2008). As a result, the dimensions or values that deem importance from the interviewee are known and have been analyzed. These results have been compared with a literature study.

Master thesis Health Sciences: Freek Hertman, 2013

- **4.4 Literature scan**
  - 4.4.1. Goal

Goal of this literature scan was to find out if more could be learned from other portals regarding chronic healthcare and the process of adding value as mentioned in the Value Specification phase of the Roadmap. This has been done on the basis of the dimensions of the HOT-FIT framework (Yusof et al., 2008). This literature scan has been done non-systematic and should answer the following question:

What can be learned from literature regarding success of portal based eHealth when comparing this with the dimensions of the HOT-FIT framework?

  - 4.4.2 Search strategy

Initial search:

Within two databases (Scopus and Web of Knowledge) literature has been found with relevant information about the research question. In order to get this information, research has been searched with the following key-words: eHealth, portal and success. These words have been used together to gain better results.

Quick scan:

After the initial search, a quick scan was performed with the following inclusion and exclusion criteria. During this quick scan the title and abstract were screened. The results of both search queries are compared.

Inclusion criteria:
- Portal based eHealth similar to MedManager's portal (No government-related portals are included)

Exclusion criteria:
- Articles not about implementation of eHealth applications
- Articles that are written in a language other than Dutch or English
- Articles written before 2000

  - 4.4.3 Data Analysis

After the quick scan, 19 articles were found relevant, met the in- and exclusion criteria and were used in this non-systematic literature scan. When an article possessed a solution to a problem regarding eHts that could be compared with a dimension from the HOT-fit framework according to the researcher, this solution was included for that dimension (Yusof et al., 2008). The first analysis showed the amount of times a dimension was mentioned in literature. This has been showed in a table. After that, a more thorough analysis per dimension showed what had been learned when looking at eHt through literature.

5. RESULTS

– 5.1 Stakeholder analysis

During the conversations with the Vice-President and a member of the board of advice, they gave their opinion about the stakeholders regarding their expert role. According to them, the following stakeholders are the key-stakeholders since they possess the power, urgency and legitimacy that has been mentioned in the Mitchell typology(Mitchell et al., 1997). All stakeholders are according to the expert group able to:
- change the eHt (power)
- have rights over the eHt (legitimacy)
- have the right to say something about the eHt when necessary (urgency).

After this, the key-stakeholders were categorized according to the theory of Sharp et al. into one of the categories users, developers, legislators or decision makers as can be seen in table 2 (Sharp et al., 1999).

Table 2: Overview of key-stakeholders according to expert-group and theory of Sharp et al.

Categories ➝ Stakeholders ↓	Users	Developers	Legislators	Decision makers
Users	X	-	-	-
GP/Diabetic Nurse	X	-	-	-
Insurance Company	-	-	X	-
Government		-	X	X
Diabetes Education Center	X	-	-	-
Diabetes Association	X	-	-	-
Industry	-	X	-	-

Analysis:
- **Users**
  They only belong to the group users, they interact with and control the eHt directly (Sharp et al., 1999).These are people with a chronic disease that are using or are intending to use the portal. This is quite broad, but their opinion is highly relevant. They actually use the end product.
- **GP/Diabetes Nurse**
  This stakeholder also belongs to the group of users, with the same reason as for the users. A physician can use the portal for its patients. But to be willing to use it, it is important that the GP feels that the portal can add value to their original program with the chronic disease.
- **Insurance company**
  They can be seen as legislators, because with their influence insurance companies can make regulations that affect the eHt (Sharp et al., 1999). Therefor companies who invest in people's health through insurances are relevant as a stakeholder, since they can determine if they reimburse a service such as the portal.
- **Government**
  The government makes policy and decides regarding healthcare, therefore they can make and change policy that makes it easier/harder for the portal to gain a place in healthcare. This explains why they can be legislators and decision makers (Sharp et al., 1999) E.g. the first version of the portal had an ISO qualification. In order to get this qualification, MedManager had to follow several procedures.

Master thesis Health Sciences: Freek Hertman, 2013

- **Diabetes Education center**
  The Diabetes education center is a learning environment for people with diabetes. They can help to make the portal a success, because of their knowledge and members. If they recommend the portal, people will start paying attention to it. Therefor they represent the stakeholder users (Sharp et al., 1999).
- **Diabetes Association**
  The Diabetes Association who takes care of diabetics' rights. If the diabetes association recommends the portal and approves its use for its' users, this can be useful for implementation (Sharp et al., 1999).
- **Industry**
  Other companies who can support the portal in many ways, even competitors. Industry helps getting the most out of a company as an effect of competition. Therefore they help to develop the eHt and can be seen as developers (Sharp et al., 1999).

- **5.2 Interviews**
  - 5.2.1 Introduction / Stakeholder analysis

The following stakeholders have been interviewed, all stakeholders worked at MedManager. In table 3 the different roles and stakeholder groups of the interviewee can be seen according to the theory from Sharp et al (Sharp et al., 1999).

Table 3: Overview of the roles and descriptions of the people interviewed

Stakeholder group (Sharp et al., 1999)	Stakeholder role	Description
Decision maker	Manager	Chief Executive Officer
Decision maker	Manager	Vice-President and Public Relations
User	Health Care Provider	Nurse who helps people through the portal
User	Health Care Provider	Dietician who helps people through the portal
Developer	ICT	Software engineer of the portal
Developer	ICT	Director of Support services

- 5.2.2 E's of eHealth

In the interviews, the interviewee ranked the 10 e's of eHealth according to their portal within a scale from 0 to 10 (Eysenbach, 2001). 0 being not important and 10 being very important. An analysis can only be made regarding these numbers because no other information was available due to the way of asking while interviewing. All average combined scores range from 6, 2 to 9, 2. In table 4 the results are shown according to the analysis mentioned in methods.

Table 4: Results of interviews about their opinion about the 10 e's of eHealth.

Interview	CEO	Vice-president	Diabetic Nurse	Nutritionist	Software Engineer	Director Support Services	Average score
Empowerment	10	8	9	8	10	10	9,2
Ethics	10	10	10	6	10	9	9,2
Efficiency	10	10	10	8	9	6	8,8
Enhancing Quality	10	8	10	7	9	9	8,8
Encouragement	8	9	9	6	10	9	8,5
Enabling	7	10	10	7	8	9	8,5
Evidence Based	10	8	10	5	7	4	7,3
Education	3	8	10	5	10	7	7,2
Extending	5	9	10	5	8	5	7,0
Equity	2	6	10	6	5	7	6,0

Analysis:
This analysis shows the different e's of eHealth according to Eysenbach, descending from most to least important according to the experts (Eysenbach, 2001).

1. **Empowerment**
   All the interviewee found this very important, hence their scores. 3 people even gave it the maximum score of 10.
2. **Ethics**
   Ethics were also really important according to the interviewee. Even 4 persons gave a 10. The nutritionist only gave it 6 points, to her it was less important.
3. **Efficiency**
   Efficiency of the portal was important as well, 3 persons scored it a 10 . The director of support services only gave a 6.
4. **Enhancing Quality**
   Another important value for the interviewee. Even though some found it very important (two persons gave it 10 points), the rest didn't.
5. **Encouragement**
   although all the scores were above 6 and only one mentioned a 6, only the software engineer gave this 10 points.
6. **Enabling**
   Although the average score was similar with encouragement, the diversity between the scores was different. The lowest score was only a 7.
7. **Evidence Based**
   The opinions were scattered on this value, ranging from a 4 to 10.

8. **Education**
   The average score isn't that low, but the lowest score given is a 3 according to the CEO.
9. **Extending**
   Although the interviewee thought that this could be important, more interviewee scored this value lower than they did the other values.
10. **Equity**
    All interviewee (except for the diabetic nurse) gave a low point to this value. The CEO, Vice-p resident and software engineer even gave it their lowest score.

- 5.2.3 HOT FIT framework

In order to improve the research and development activities, possibilities were mentioned in the interviews that could be compared with the theory of Yusof et al (Yusof et al., 2008). Only those values that are found in the interviews will be a part of this research, as can be seen in table 8. The dimensions that have not been found won't be mentioned in this part of the results. However, they are still important for the value specification phase of the roadmap.

Table 5: Dimension from HOT-FIT framework that are mentioned in the interviews

Dimensions mentioned	Dimensions not mentioned
Information Quality	System Quality
Service Quality	Organizational Structure
System Use	Organizational Environment
User Satisfaction	Net Benefits

Information quality:
In the interview with the nurse she came up with a solution to make the portal more interactive, what can been seen as a way to improve the information quality because it would improve the accuracy of the information given (Yusof et al., 2008): 'That interactive piece could be used to assess peoples knowledge, so you could build a, almost like a lessons map, when you go through it, there's a quiz, and that little quiz can be developed to be an in designated tool' (Personal communication, February 7, 2011).
The director of customer service mentioned the following: 'I think that the biggest thing that can be done to improve the portal: re-invest in some of the fundamentals that it was built on' (Personal communication, February 7, 2011). This would also improve the portal's information quality by giving more specific information that is tailored to the user's demands and needs and therefore it's reliability and accuracy of the information given (Yusof et al., 2008).

Service Quality:
The director of customer service felt that the service quality could be improved by changing the user permission, so that users don't have to know everything about every part of the portal. 'And I think there are some things about user permission, and the way people see the portal when they first come on to it, it's still intimidating' (Personal communication, February 7, 2011). With this solution, the responsiveness and empathy of the user would improve, therefore the support delivery would improve (Yusof et al., 2008).
Another solution comes from the director of customer service, who mentions that users should be able to have access to some kind of conversation with their HCP. This would improve the service given to the users. 'Get them access to conversation, whether that's community, health care providers, give them a reason to keep coming back over and over again and I don't see any way to do it without social interaction' (Personal communication, February 7, 2011). The dietician mentions that she wants to

Master thesis Health Sciences: Freek Hertman, 2013

link the portal to the computer functions that people already use, such as e-mail. This way, the quality of service would improve by supporting people to adapt the portal more to their own lifestyle. 'I think that if linking it to the computer functions that they already use, so e-mail comes to mind '(Personal communication, February 7, 2011). In both the opinion of the dietician and the director of support services, the overall support delivery would improve, because the users could have more empathy with the product by getting to know it in a familiar setting (Yusof et al., 2008).

System use:

To improve the non-usage attrition for the user, a possible solution can be to improve ease of use according to the software engineer and vice president (Personal communication, February 7, 2011). This could lead to more use of the technology, therefore it tells something about the system use (Yusof et al., 2008).

The director of support services pointed out that it could be an idea to 'roll out' the portal for new users. A user starts off with only a few (necessary) functionalities and when the user is used to it, more functionalities will be added. 'I think we could do a lot of things by introducing features to the portal step by step. So when someone comes on to the portal for the first time, you could do a lot to tear down the interface and say you only need to care about this, this and this right now' (Personal communication, February 7, 2011). This idea could improve the system use, because it makes sure that the activities shows the knowledge of users and their expectations (Yusof et al., 2008).

The software engineer wanted to extend the use of the system. 'Finding ways to allow our customer to access the information on the portal or to see the portal with more data' (Personal communication, February 7, 2011). In this way, the system use would improve by adding more actual functions of the portal (Yusof et al., 2008).

User satisfaction:

The CEO expressed that he would simplify the interface, so that the portal is easier to use, especially for first time users. 'So what I would improve now, I would simplify the interface. It's confusing for first time users' (Personal communication, February 7, 2011). This idea would change the perceived usefulness of first time users and therefore the user satisfaction (Yusof et al., 2008).

The vice president mentioned that the portal should be more about the users instead of professionals. 'In many ways the portal has been designed according to what professionals think the portal should do for somebody and what an individual should do on the portal. It is not necessarily well designed to accommodate human nature'. Furthermore he mentions that 'the portal really needs to be simplified, with the capacity for advanced users but at its primary core we need to identify; are people really going to use it? And why do they want to use it?' (Personal communication, February 7, 2011). The user's attitude towards technology is important and therefore it should be taken into account in development (Yusof et al., 2008).

The software engineer mentioned the following about getting to know user satisfaction: 'we could do more studies into how users are reacting to the portal….So we understand their mentality instead of our mentality' (Personal communication, February 7, 2011). Getting feedback from users is an important way to improve the portal according to the nurse. 'Get their feedback, get their input. Focus groups. Listen to each user and evaluate what they are telling us and continue to build the portal' (Personal communication, February 7, 2011). Both the software engineer and the nurse emphasized the importance of the attitude of the user towards the portal and the importance of user satisfaction (Yusof et al., 2008).

- **5.3 Literature scan**

In table 9 the results show which dimensions are found in the literature scan according to the HOT FIT framework's dimensions (Yusof et al., 2008). The analysis on the next few pages will consist of information from the found articles about all dimensions of the HOT FIT framework, categorized by the according dimensions. Also a general topic that summarizes why this dimension has been chosen will be part of this analysis. This will be shown in tables seven to fourteen on the next pages.

Table 6: Found articles with dimensions found of HOT-FIT framework

#	Author(s) of article & title:	System Quality	Information Quality	Service Quality	System use	User satisfaction	Organizational structure	Organizational environment	Net Benefits
1	(Beul, Ziefle, & Jakobs, 2011) 'Users' preferences for telemedical consultations: Comparing users' attitude towards different media in technology-mediated doctor-patient-communication'					X			
2	(Boonstra & van Offenbeek, 2010) 'Towards consistent modes of e-health implementation: Structurational analysis of a Telecare programme's limited success'			X			X	X	
3	(Freyne, Berkovsky, Baghaei, Kimani, & Smith, 2011) 'Personalized techniques for lifestyle change'				X	X			
4	(Gajanayake, Iannella, & Sahama, 2011) 'Privacy by information accountability for e-health systems'	X	X						
5	(Haddad & Chetty, 2012) 'Development of a smart e-health portal for chronic disease management'					X			
6	(Hawkins et al., 2011) 'Integrating eHealth with human services for breast cancer patients'				X				X
7	(Heuwinkel, 2006) '"Nursing ICT" Methodological approach to analyse patients' needs and expectations'					X			
8	(Khoja, Durrani, Scott, Sajwani, & Piryani, 2013) 'Conceptual framework for development of comprehensive e-health evaluation tool'	X	X	X		X		X	X
9	(Kreps & Neuhauser, 2010)								X

#	Article								
	'New directions in eHealth communication: Opportunities and challenges'								
10	(Mechael, 2007) 'Creating an enabling environment for mHealth'		X		X	X			
11	(Nordfeldt, Hanberger, & Bertero, 2010) 'Patient and parent views on a web 2.0 diabetes portal-the management tool, thegenerator, and the gatekeeper: Qualitative study'		X			X			
12	(Pemu et al., 2011) 'Socio-demographic psychosocial and clinical characteristics of participants in e-healthystrides ©: An interactive eHealth program to improve diabetes self-management skills'					X			
13	(Stinson et al., 2010) 'Usability Testing of an Online Self-management Program for Adolescents With Juvenile Idiopathic Arthritis'					X			
14	(Strecher et al., 2008) 'The Role of Engagement in a Tailored Web-Based Smoking Cessation Program: Randomized Controlled Trial'		X		X				
15	(Sultan, Mohan, & Sultan, 2009) 'Managing change: Experiences from a new e-Health initiative for patients with diabetes and cardiovascular disease'		X	X		X			X
16	(Tufano & Karras, 2005) 'Mobile eHealth interventions for obesity: a timely opportunity to leverage convergence trends'		X						
17	(Valdez, Ziefle, Alagoz, & Holzinger, 2010) 'Mental models of menu structures in diabetes assistants'	X							
18	(van der Vaart, Drossaert, de Heus, Taal, & van de Laar, 2013) 'Measuring actual eHealth literacy among patients with rheumatic diseases: A qualitative analysis of problems encountered using health 1.0 and health 2.0 applications'				X				
19	(Warren et al., 2010) 'Implementations of health information technologies with consumers as users: Findings from a systematic review'					X			X
	Total # of articles found about the HOT-FIT framework	3	7	3	5	11	1	2	5

In this next part the results from the literature about the different dimension will be showed. This result will contain a topic that highlights the dimension. Also a short analysis and a quote will be part of this result.

Table 7: Found results for system quality

Author(s)	Topic	Analysis	Quote
Gajanayake, Iannella, & Sahama, 2011	Security	They emphasize on system quality by addressing the need of security for e.g. privacy.	'If security is breached the loss of control of private data give rise to privacy concerns'
S. Khoja, Durrani, Scott, Sajwani, & Piryani, 2013	Reliability	Khoja et al. made an overview of aspects that are important according to them for eHts. One of them is technology outcomes which includes e.g. reliable hardware and timeliness of the application	N/A
Valdez, Ziefle, Alagoz, & Holzinger, 2010	Framework	Another positive remark was made about the quality of the framework and therefore the system. If this framework is good, it can help enhancing system quality.	'…but the mental model and especially lack thereof can heavily impact whether initial usage of a device is successful or has a propensity for failure'

Table 8: Found results for Information quality

Author(s)	Topic	Analysis	Quote
Gajanayake, Iannella, & Sahama, 2011	Reliable information	Reliable information should be requested by users in order to achieve the goals of an eHt.	'The essence of all this, then focusing on IA (Information accountability), is the user of the information is held liable to explain, justify or answer for their use of information, when requested by the party to whom the information belongs to'
S. Khoja et al., 2013	Relevance	The accuracy and relevance has been set as a goal for implementation for eHts.	N/A
Mechael, 2007	Reliable information	One of the conclusions from this research that reliable information is essential for success of an eHt.	'Access to reliable and relevant content that reflects conditions in low and middle income countries at the right time is a critical consideration within mHealth'
Nordfeldt, Hanberger, & Bertero, 2010	Reliable information	They found a good system quality that the given information was reliable. This gained the trust of the users.	'Thus, being enabled to find correct, reliable information provided by local practitioners was regarded as very advantageous, making it easier to feel secure and in control'
Strecher et al., 2008	Perceived quality	The perceived quality of the information given	N/A

Master thesis Health Sciences: Freek Hertman, 2013

		was of influence with the impact that this web-based intervention had on its' users.	
Sultan, Mohan, & Sultan, 2009	Reliable information	Accountability and evidence-based information help to improve the chance of success with the eHt. Providing feedback that is timely and relevant is a key imperative.	N/A
Tufano & Karras, 2005	Reliable information	Tailored materials are significantly more effective than non-tailored.	'Tailored informational interventions, which, in recent years, have proven to be the most effective form of conventional health behavior intervention for weight loss, are discussed.'

Table 9: Found results for service quality

Author(s)	Topic	Analysis	Quote
Boonstra & van Offenbeek, 2010	Quality of service	They mention the importance of telecare technology. This implies the importance of the way service works and the quality of the service delivered.	'Telecare is the use of information and communication systems to facilitate care delivery to individuals in their homes. Although the expectations of telecare are high, its implementation has proved complex.'
S. Khoja et al., 2013	Quality of service	The following aspects that are mentioned can be seen as service quality for their outcome of technology: problem handling, user friendliness and flexibility.	N/A
Sultan et al., 2009	Quality of service	Better communication and support enhances the service quality.	'Helpful to the change process is the availability of a generous supportive environment both physical and psychological'

Table 10: Found results for system use

Author(s)	Topic		Quote
Freyne, Berkovsky, Baghaei, Kimani, & Smith, 2011	Actual use	The actual use was measured and can be used to explain differences regarding success.	'As can be seen, the uptake of the personalized feeds was higher than that of the non-personalized feeds'
Hawkins et al., 2011	Actual use	This research showed the need for system use by measuring the actual use and compare this to different outcome measures.	'Outcomes were analyzed according to the intent-to-treat principle with analyses of covariance using covariates selected a priori to reduce error variance through their likely relationships to outcome measures: age, education, minority status, and days since diagnosis'

Master thesis Health Sciences: Freek Hertman, 2013

Mechael, 2007	Actual use	An eHt can be improved by using information from the actual use according to Mechael.	'By examining existing patterns of use, one might also identify potential areas in which there is a demand for more formalized hardware or software development that will enhance user experiences
Strecher et al., 2008	Actual use	Strecher et al. cope with system use by comparing the actual use of the eHt.	'More personalized source and high-depth tailored self-efficacy components were related to a greater number of Web sections opened'
van der Vaart, Drossaert, de Heus, Taal, & van de Laar, 2013	Actual use	One of the results proved the users' background and its correlation with usage of the eHt.	'We found that patients who are higher educated, younger, and have higher self-perceived Internet skills, on average completed more assignments independently, performed better, and encountered fewer problems

Table 11: Found results for user satisfaction

Author(s)	Topic	Analysis	Quote
Beul, Ziefle, & Jakobs, 2011	User satisfaction	User satisfaction shows great value due to the way an eHt works.	"In this paper, an exploratory survey was conducted to detect acceptance motives of five different media"
Freyne et al., 2011	User satisfaction	Personalized tools help to improve the user satisfaction.	'We have presented in the paper our initial findings, which suggest that personalized tools have the ability to boost user interaction, simplify information access, and motivate users'
Haddad & Chetty, 2012	User satisfaction	An active role of users improves the way an eHt is perceived.	'The proposed smart portal framework empowers patients to have an active role in managing their chronic conditions, and be easily connected to information and people for a better self-care'
Heuwinkel, 2006	User satisfaction	Their model shows a way of coping with user satisfaction.	'... the aim is to develop a "thick description "of patients 'lives by getting very close to them"
S. Khoja et al., 2013	User satisfaction	The users' perception has been taken into account by measuring user acceptance e.g. both health service outcomes and technology outcome derive the opinion and satisfaction of the user.	N/A
Mechael, 2007	User satisfaction	This research shows that users' experiences are being used in order to develop the eHt.	'In this process technologies are made into something familiar in both a practical and emotional sense. By observing individual experiences, patterns and themes can be used to identify collective meaning and understanding'
Nordfeldt et al., 2010	User satisfaction	Users' attitude towards their eHt depends on the way an eHt should be designed.	'We aimed to explore patients' and parents' attitudes toward a local Web 2.0 portal tailored to young patients with type 1 diabetes and their parents, with social

Master thesis Health Sciences: Freek Hertman, 2013

Author(s)	Topic	Analysis	Quote
			networking tools such as message boards and blogs, locally produced self-care and treatment information, and interactive pedagogic devices'
Pemu et al., 2011	User satisfaction	Based on this research, it is important to know what the users value most.	'Our results confirm that this population has a need for self-management skills training based on their confidence levels with self-management skills and inadequate diabetes control'
Stinson et al., 2010	User satisfaction	Via usability testing more can be learned about the users and their visions.	'Usability testing is a crucial step in the development of self-management health portals to ensure that the various end users (youth and parents) have the ability to access, understand, and use health-related information and services that are delivered via the Internet and that they are delivered in an efficient, effective, satisfying, and culturally competent manner'
Sultan et al., 2009	User satisfaction	One of the issues with change management is the way users feel towards this change.	'Change management involves a number of issues involving assessment, challenge, support, results and the context, and we have shown how these issues can be addressed when designing a mobile telemedicine system, ensuring greater chance of success'
Warren et al., 2010	User satisfaction	When looking at other research, more can be learned about successes of user satisfaction of eHts.	'There have been a number of demonstrated instances of clear successes in both uptake and outcome for health IT interventions involving consumers as users, particularly for chronic condition management'

Table 12: Found results for organizational structure

Author(s)	Topic	Analysis	Quote
Boonstra & van Offenbeek, 2010	Structure of organization	The structure of an organization can be important, but this needs more research.	'To date, empirical IS structuration studies have paid little attention to the notion that technology appropriation takes place within a certain institutional context with its own structural features'

Table 13: Found results for organizational environment

Author(s)	Topic	Analysis	Quote
Boonstra & van Offenbeek, 2010	Stakeholders	The influence of stakeholders can be important when developing an eHt.	'Moreover, given the diverse stakeholders, e-health implementation takes place within a multidimensional institutional context'
S. Khoja et al., 2013	Policy outcomes	They define policy outcomes as one of their outcomes. This way, they extend their scope to other organizations that provide e.g. policies or support funding for an eHt.	N/A

Master thesis Health Sciences: Freek Hertman, 2013

Table 14: Found results net benefits

Author(s)	Topic	Analysis	Quote
S. Khoja et al., 2013	Framework outcomes	They have made a framework to implement an eHt. All kinds of different outcomes are relevant according to this framework; but some (like economic outcomes or behavioral outcomes) are similar to net benefits of the HOT-FIT framework.	N/A
Sultan et al., 2009	Different kind of outcomes	Sultan et al. made different kinds of outcomes that can referred to the net benefits of an eHt.	'The results refer to the direct and indirect outcomes; a desired state with lasting impact. In the context of patient-oriented e-Health initiatives, the desired result is often the patient being in an improved state of health'
Kreps & Neuhauser, 2010	Actual results	This research shows some actual results from implemented eHt and what can be learned from them.	'With some exceptions, eHealth strategies are showing improved, but not stunning, results. Many questions remain about how meaningfully eHealth applications can be used to influence health behaviors and coordinate the development of health care services'

6. CONCLUSION & DISCUSSION

This study took the concept of the CeHRes Roadmap as a guideline and applied it afterwards to a case study from MedManager. The same was done with literature to test the possible outcomes of this research when looking at the Roadmap.

The results from this study showed several possibilities that can be learned when looking at the first two phases of the Roadmap and comparing this with a case study and literature, divided into three conclusions:

- **6.1 Stakeholder approach**

Van Limburg et al. showed in their article the possible success of stakeholder approach regarding the development of an eHt. One possible way to gain this success is by business modelling (van Limburg et al., 2011). In the case of MedManager, this hasn't been with the design of this eHt. The development of this eHt was expert-driven and technology driven. In the future, a new development should include all stakeholders that are important to have a better chance of success by creating value via participatory development. In an article of Spil & Kijl one of their conclusions is that e-health innovation seems to be mostly technology driven instead of being focused on value creation (Spil & Kijl, 2009). This phenomenon leads to eHt getting stuck in the implementation phase, just like MedManager's portal. Therefore a stakeholder approach can be useful to prevent this.

This is also mentioned in an article of Pagliari; 'The clinical appropriateness and usability of eHealth technologies have been compromised by insufficient end-user engagement in the design process' (Pagliari, 2007). However, she states there are some challenges that have to be dealt with when working with a stakeholder approach such as overcoming cultural and methodological division between different disciplines and the tension between the need to innovate and the pressure to adopt methodologically robust standards. Especially in health care this second challenge is present due to the fact that 'normal' health care is mostly evidence-based.

Boonstra et al. also try to show the role of a stakeholder when looking at an eHt. They show this by creating a model that shows the connection of stakeholders with the telecare technology and the institutional context. They conclude: 'As such, our study supports the growing body of literature on technology's 'interpretive flexibility' (Boonstra & van Offenbeek, 2010). This means that it depends on the type of eHt to what extent all stakeholders have to be a part of the implementation phase.

Overall, the idea of a stakeholder approach is recommendable when developing an eHt such as the portal from MedManager, but challenges have to be taken into account.

Van Limburg et al. showed in their article the possible success of applied to the design of this eHt. This is also mentioned in an article by Pagliari; 'The clinical appropriateness and usability of eHealth technologies have been compromised by insufficient end-user engagement in the design process' (Pagliari, 2007). However, she states that approach when looking at an eHt. Several challenges have to be taken into account.

- **6.2 E's of eHealth**

When comparing the E's of eHealth with the case of MedManager, a few things seem to be important. These E's have been ranked to their relevance according to the employees of MedManager. A new eHt should focus primarily on the empowerment of patients and the ethics part when comparing it with the 10 e's of eHealth from Eysenbach (Eysenbach, 2001).

Empowerment was the most important E. In order to achieve empowerment, the eHt has to be patient centered and it should give the patient an evidence based choice. This follows the perception of 'normal' health care, where evidence-based information is important. This can also be seen as a sign that the information quality of the eHt is important according to the interviewee. In the found literature this is the same when looking at the dimension information quality of the HOT-FIT framework (Yusof et al., 2008). Seven from the nineteen found articles mention this dimension. Mechael e.g. addressed the need of relevance and reliability of information for users, so that they can make their own choices better (Mechael, 2007).

Also the **ethics** part seemed to be important (Eysenbach, 2001). This can be compared with an aspect from the dimension system quality of the HOT-FIT framework (Yusof et al., 2008). One of the aspects of system quality is privacy. Gajanayeke et al. mention this by addressing the need for good security: 'If security is breached the loss of control of private data give rise to privacy concerns' (Gajanayake, Iannella, & Sahama, 2011). This shows the need for taking care of ethics and making sure that users feel secure when using the eHt when developing an eHt.

Efficiency was also quite important to the interviewee. The employee of MedManager feel that this is important for their portal, however it is not their priority. Increasing efficiency however is difficult and more research should elaborate on this subject.

Enhancing quality is the next E in line. According to the employees of MedManager, a new portal should include some aspects that are enhancing quality. When comparing this with literature a different type of quality can be seen from the dimensions of the HOT-FIT framework; Information and system quality (Yusof et al., 2008). In the case of MedManager, especially the system quality should be improved since they feel that the system was outdated. The fact that they had the ISO certification shows that the quality of information was pretty good.

Encouragement of users is the next E. Users should be encouraged to use the portal and to have a healthy lifestyle. In the article from Sultan et al, they elaborate on this principle by adding positive feedback: 'Helpful to the change process is the availability of a generous supportive environment both physical and psychological'(Sultan, Mohan, & Sultan, 2009). This solution can be applied to the portal as well.

Enabling information exchange was not that important to the employees of MedManager due to the fact that their product was a stand-alone product. It doesn't have any communication (data-wise) with other applications in Health Care and they had no intention to implement this. However, in the literature search information was found about adapting to the lifestyle of the patient. Hawkins et al. concluded on their hypothesis that patients who had access to more types of interventions (Internet and e.g. a mentor) showed better outcomes (Hawkins et al., 2011).

The fact that they didn't find it that important as well that the information given was **evidence based**, probably comes from the business point of view from MedManager. Their goal is to help people, but they also need to make money via their product. If people use the portal and feel that they are being helped, this would be more important than the actual evidence based outcome.

Education is not that important to the employees of MedManager as well. This should however be one of the important e's, since the literature search showed that 11 out of the 19 found articles about success factors mention user satisfaction. If people tend to learn how to deal with their disease via education, this increases the user satisfaction. Pemu et al. confirm this with their findings about people wanting more control by education: 'Our results confirm that this population has a need for self-management skills training based on their confidence levels with self-management skills and inadequate diabetes control'(Pemu et al., 2011).

Extending scope of health care is not important for the employees of MedManager. Their focus lies within the portal and keeping patients (or actually they can be seen as 'costumers') attached.

However, if they could find a way to extend the scope of care to fit the portal more into normal routine of patients this could improve the portal. The same conclusion was made by Kreps et al. They show the need for eHealth to adapt and intervene with day to day life in order to succeed. 'eHealth information that is interactive, interoperable, personally engaging, contextually tailored, with the ability to be delivered to mass audiences can really make a difference in enhancing the quality of health care and health promotion efforts'(Kreps & Neuhauser, 2010)

The least important value from the e's of Eysenbach was the e of **equity**. This importance can be explained due to the fact that MedManager's eHt was built in Canada and it was a commercial product. The interviewee perhaps didn't care that much for equity since they had to sell the product. When looking at government implementing eHts, equity can be much more important. The government's reach and goals are different from those of an institution according to Khoja et al (Khoja, Durrani, Scott, Sajwani, & Piryani, 2013). Where government's focus lies broader (e.g. innovative and forward-looking policies) an institution would focus on the standards of care instead.

– **6.3 HOT-FIT framework**

A large part of this study showed the comparison of needs and demands of stakeholders. What values are important according to the interviewee and what does literature tell? These have been compared according to the HOT-FIT framework from Yusof et al (Yusof et al., 2008). When looking at all the dimensions from the framework, some of them seem to be more important than others. These conclusions will be made according to the comparison that are derived from the interviews from those dimensions that were mentioned and those that were not mentioned during the interviews by the interviewee.

Dimensions mentioned

Information quality can be improved by providing the right information that adds value to the customers. The employees of MedManager felt that this could be improved within their portal. They tried to increase the information quality by adding feedback that was provided by a pilot study in an elementary nursing home. Literature showed several ways to do this as well. As can be seen in table 8 Tufano et al. show this by addressing the need of tailored information. Information should by tailored to their customers (Tufano & Karras, 2005).

The **service quality** is also an aspect that has been mentioned in the interviews. Compared with literature, the same issues show. The service of the eHt has to be good and can be improved by adding more interactivity. This would enhance the quality of the service according to Sultan et al, because when there is a supportive environment this is helpful in the change process of a patient (Sultan et al., 2009). In the case of MedManager, the service quality was taken care of by obtaining the ISO standard. This guarantees that some parts of quality are taken care of.

When looking at the **system use**, there is a difference between the results of the interviews compared with the literature. The interviews focus on the way the users sees the portal and how they should actually use the system. The literature focusses more on the actual usage of the system as an important dimension and then tries to evaluate why someone uses the system. In table 10 the study of Strecher et al. shows that when the application is more tailored to the needs of a patient, the amount of web-sections opened increases (Strecher et al., 2008). This is useful information and in order to improve the system use, MedManager should log and use such information. However, they didn't do this due to the fact that the eHt didn't pass the portal phase.

User satisfaction seems to be very important according to the interviews and the number of times it is mentioned in literature (eleven out of the nineteen articles). This however, may actually explain one of the problems that are faced with when developing and designing an eHt. It appears that the focus with eHt lies on the patient and the problems and opportunities they face. This seems logical, since users are going to use the eHt eventually and without them, the need for an eHt wouldn't be there. However, due to this, the focus is rather one-sided. Also in the model from Yusof et al. the user is the main actor. When looking at the dimension system use or information quality, this is measured by the

way the user uses the eHt or understands the information. Therefore the focus also lies with the user. A new development of an eHt should focus on the needs and demands of users, these are most important. MedManager tried to focus on the users, but instead most of the ideas they had were expert-driven. They developed the eHt according to their own point of view with the user in mind instead of creating it with the user.

Another aspect regarding users is the way to make contact with the eHt and their attitude towards it. It is difficult to compare traditional healthcare (e.g. face-to-face contact with a doctor) with eHealth. Hawkins et al. mention this aspect in their research and compare the integration of eHealth with normal health care. They conclude that 'Integrating human and computer-based resources for breast cancer patients benefits them more than either alone'(Hawkins et al., 2011). A new eHt would therefore possibly gain more success if it is integrated into normal health care. Research from Beul et al. confirms this conclusion with the conclusion from their own research: 'Findings on the medial preferences show that a face-to-face consultation is still highly preferred compared to telemedical applications in the standard case (Beul, Ziefle, & Jakobs, 2011).

Dimensions not mentioned

In the interviews, no one mentioned **system quality**. In literature, when searching for success factors, this tends to be a success factor. Five out of the nineteen found articles mention this dimension. As mentioned in table 7,if clients feel that the system is reliable this could be a positive factor according to Mechael (Mechael, 2007). Otherwise, if this isn't taken care of, users can lose their interest in using the eHt. Therefore it is important to implement this aspect in developing e-Health also when looking at the MedManager case.

When looking at the other dimensions from Yusof et al. the least amount of information is available about the organizational part of an eHt, both **organizational structure** and **organizational environment**. In the interviews nothing was mentioned regarding these dimension. The organization that is responsible for the eHt and other organizations that have an impact on the eHt are however important. As can be seen in table 13 Boonstra & van Offenbeek mention this importance by developing a framework that consists of these dimensions as well. In their opinion, organizations and its stakeholders can be essential: 'The specific structurational concepts applied – technology appropriation and social multidimensionality – help in understanding how the implementation mode that emerged from the interaction among actors, technology and institutional contexts resulted in limited appropriation'(Boonstra & van Offenbeek, 2010). In table 13 it can also be seen that Khoja et al. described this phenomenon as well and developed their own framework. This framework also focusses on the relation between organizations: 'Evaluation of any e-health program should not be limited to health outcomes or economic analysis, but should cover all themes identified in the KDS Framework' (Khoja et al., 2013). This implies the need to not only focus on a small aspect of the eHt but include anyone who has a link with the eHt. Future research should focus on these organizational aspects to study the effects organizations have regarding eHt. This would enhance the eHt of MedManager since they didn't include this in their original efforts.

The final dimension from the HOT-FIT framework is **net benefits**. Although this hasn't been mentioned in the interviews, this can be considered as a dimension that is difficult to measure. The problem with measuring end-results is the way to do it. E.g. one of the results can be by measuring the QALY (Quality Adjusted Life Years) or DALY (Disability-adjusted life years) of a patient. However, measuring these variables is complex and may not always be appropriate. With the net benefits, the actual results are mentioned according to Khoja et al (Khoja et al., 2013). When developing eHealth, it can be useful to think about the end-results and the net benefits that have to be achieved. This way the outcome can be measured and a guidance can be given to steer.

- **6.4 Shortcomings of this study**

A couple of things can be improved when looking at this study:

- The structure and focus of the research's subject changed throughout the whole process a couple of times. At first, the research goal was to develop a business model with all the stakeholders involved. Due to large (physical) distances between stakeholders and not enough time to do this, the subject changed to only those stakeholders who were available. Coming back from Canada to the Netherlands, there was not enough information gathered to apply the original idea for this research. Therefore the original information was somewhat used in another way. The results from the interviews didn't have the goal they were used for now. The original plan was different, but due to lack of useful information in the original plan, this goal changed. Therefore, some of the results weren't valuable and had to be used in a different way together with literature research.
- Not all necessary steps are taken in order to describe the environment in the contextual inquiry. In this study, the stakeholders are chosen by people who work at the same company.
- In order to improve the contextual inquiry, all stakeholders could have been involved. This didn't happen due to lack of time and long travelling distances in Canada.
- In the interviews, the respondents only ranked the e's of eHealth with a number. Looking back, more insight would have been given by expanding their vision and opinion about the e's of eHealth.

- **6.5 Future research**

Two types of future research can be done following this research:
First of all, this research only focused on the first 2 phases of the CeHRes roadmap: Contextual Inquiry and Value Specification. Because it is a holistic framework and all phases are connected, it is important to look at the whole process instead of focusing on a small part. Future research should be about the whole process of an eHt as described in the framework. Starting from scratch, ideally an eHt should be followed until a few years into implementation. The results from that research should give a better overview of the strength of the CeHRes roadmap.
On the other hand when only looking at these 2 phases from the roadmap that are used in this research, more information about the effect of all different types of stakeholders is needed. In current research about eHt, the focus lies on the input from users. Other stakeholders are less mentioned, although research (especially about business modelling) shows the need to involve all stakeholders from the beginning. Future research should focus on this aspect.

Master thesis Health Sciences: Freek Hertman, 2013

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8. ATTACHMENTS

–   **8.1 Interviews**

Interview schema

Questions	Category for analysis
1. Could you please introduce yourself?	Introduction
2. What is your function within the company?	Introduction
3. What is your relation with the portal/Live well coaching?	Introduction
4. How do you like working with the program (in general)?	Introduction
5. What do you feel could be added to the portal to improve it in anyway?	Improvements (HOT-FIT)
6. Could you please give your importance with the portal regarding the following topics on a scale from 0 to 10?	Eysenbach 10 E's
7. What do you believe is the best way to improve the engagement of the portal for the users?	Improvements (HOT-FIT)

Interview #1: CEO

Category	Questions	Answers	Analysis
Introduction	1. Could you please introduce yourself?	I got into the web application development business when Huey invented the internet. And a small company that built the back end of websites, so manages the databases and such. We did that in a time when this was all very new and most websites were just brochure-wear. And then I, that business got me some clients were I build some applications in the map industry. So I built an application that was similar to Google maps, in terms of the functionality but a lot rustier. And then I built a little bit of barge companies that was again about application development hosting communication services. At that time, we met a couple of people interested in building an application for diabetics and collaborated and joined forces and that turned into this company. That has, as you already know, an application for helping diabetics and health care workers through the internet.	n/a
Introduction	2. What is your function within the company?	CEO.	n/a
Introduction	3. What is your relation with the portal/Live well coaching?	My relationship with it has changed over time; I built it first verse many years ago. But it's been a long time since I've been hands on with it. I don't, from a high level I oversee the development of it, but I'm not hands on with it. And I don't use it, in terms that I perform my duty. There're clients I've spoken to and I've heard the feedback from them and that makes its way into the design new version of the portal. I wear many hats.	n/a
Introduction	4. How do you like working with the	Not applicable.	n/a

Master thesis Health Sciences: Freek Hertman, 2013

	program (in general)?		
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	Oh my goodness. I guess you've probably already gone through this affair with the others as I understand from the conversations. But we generally felt that our portal is very dated, old and clumpy. That was the result of the pro-testers we had in terms of medical device regulations. We've already covered some ISO 1345 process that really hampered our ability to move the product forward. So what I would improve now, I would simplify the interface. It's confusing for first time users. F: Would you only like to change it for first time-users? M: If I had to priorities, I mean you can't only change it for first time users and not make it better for everybody. But the priority is first time users. We just found that those people who get over that hurdle and understand how you use the portal and get to the functionality that useful for them that they're fine. They've lost their username and password once in a while, it happens with all sorts of applications. But most of the time when people know how to do it they are fine. They have a certain way of they can make their way through it. But there is often, much too often, confusion for the first time they use it. So that is that in terms of I think some a lot of the components in the applications are, I think are generally confusing. People don't know what they need to do with it to get there. They don't know the purpose. If they are told about it, they can see their records. But it is not as clear as it should be why they're doing it. And it is less clear than ever, because it such a dog briefest of so much functionalities and so many links.

Much easier for us would be the new coaching business, which I think has been described to you. Our clients | **System use**

System use |

		now are being directed via a coach, so keep logging into the portal. I've left some messages there for you. I want you to upload your blood glucose readings, are they ok? You know, if they have a problem with that, they call up and get a tutorial from Marcus. He takes them through the system and teaches you how to do it. It still clumsier than in should be, but we're making out for the shortcomings of the programme by adding in some support. So it's not urgent at this time, with the coaching business as it has been with some off building ointment.		
Eysenbach 10'es	6. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, what is e-health?)**	**Interview / Empowerment / Ethics / Efficiency / Enhancing Quality / Encouragement / Enabling / Evidence Based / Education / Extending / Equity** (see table below)		**n/a**
Improvements (HOT-FIT)/ Eysenbach	7. **What do you believe is the best way to improve the engagement of the portal for the users?**	Improve engagement? Make it less confusing, reduce confusion. More intuitive.		**System use**

Detail of question 6 table:

Interview	CEO	
Empowerment	10	
Ethics	10	
Efficiency	10	
Enhancing Quality	10	
Encouragement	8	
Enabling	7	
Evidence Based	10	
Education	3	
Extending	5	
Equity	2	

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Interview #2: Director of support services

Category	Questions	Answers	Analysis
Introduction Introduction	1. Could you please introduce yourself? 2. What is your function within the company?	My name is….. My position, my title here is director of support services for MedManager. But really my day-to-day job is very varied. I have a lot of responsibilities and I'm part of a startup so a constantly changing job description. Terms of schooling: II studied software engineering at the University of Waterloo for a couple of years and then I studied complex part authorization . When I switched majors for a while but neither of does actually resulted in a degree for me. So I'm still, haven't actually graduated for University of Waterloo. But lots of background in technology and software development in particular. I started of my position in quality assurance here at MedManager. So a group of four back in 2008 I believe. Where I was first hired as a contract worker doing testing when they were doing with the French language projects, trying to make it bilingual acceptable. And since then, it's been a progression of Mike thinks up something new and usually it needs to get done and I try to do it or not. Trying to classify what I do is pretty corky. most of my work is centered around is trying to figure out how to provide to port for the coaching therapists. That includes technical support, sales profit, registration of new clients, still the primary tester of the portal itself and work with … on a bunch of the designs for things. I have a particular personal interest in human-computer interaction, so user interfaces and how people approach technology. I worked in technical support for Internet	n/a

Master thesis Health Sciences: Freek Hertman, 2013

		Company 3,5 years. So I have a lot of experience to listening what people struggle with. And what they had problems with in the past. So I try to bring that information to bear when I think about an interface that is intuitive for users. And some of the common problems that people have when they're approaching something new.	
Introduction	3. **What is your relation with the portal/Live well coaching?**	My primary relationship with the portal, I do testing for the portal. So when … has developed something I'll be ending up the one who's beating it up. I go in, push every button, try ever page, try and break it. Then the other part of my job involve providing portal tutorials, training, technical support, so when we had a new client like Luthor village I was the one who trained the staff. So I would go in and teach them how to use it. When we have costumers, when a new costumers enrolls for coaching we offer a free portal tutorial. We sit down for about 20 minutes and teach people all the basics how to get around the portal. And really as we grow I'm becoming politely more detached from the portal in terms of its more looking like I'm going to be involved with managing the technical support staff. As for now, I'm working as an administrator of the portal. And helping to provide technical support. Training and stuff like that.	**n/a**
Introduction	4. **How do you like working with the program (in general)?**	Very general question. The portal is a piece of technology that's constantly evolving. But being the one whose job it is to constantly break it, go in and see what I can do to screw it up. I'm constantly thinking about	**n/a**

		what's wrong with it in oppose to what's right with it. So although I'm very proud of lot of the things that we've done to improve it from a year. I think we've made a huge jump in usability and first time experiences. I have this constant list in my head of things that are wrong and need to be fixed in the next edition. So I'm aware of its flaws.	
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	I think that the biggest thing that can be done to improve the portal: reinvesting some of the fundamentals that it was built on. The portal is still using technology that is 8-10 years old now. And some of the assumptions that were made when it was first build, were designed for a platform that was build quick, get it out there. That's fine, except it's just a layer. And I think there're some things about user permission, and the way people see the portal when they first come on to it, it's still intimidating. The word comprehensive has been thrown around, it described the portal and it a nice way of saying it's complicated. I think we could do a lot of thing by introducing features to the portal step by step. So when someone comes on to the portal first time, you could do lot to tear down the interface and only say you only need to care about this, this and this right now. Once you've set up your profile a little bit, and maybe then after your first blood glucose upload, then we'll show of the other functionalities. If you roll things out, step by step, then it's becomes less intimidating. A lot of what the problem of the portal is, is that it has so much information people could use,	**Information quality** **Service quality** **System use**

		they don't know where to start. So some guidance for new users.	
Eysenbach 10'es	6. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, What is e-health?)**		**n/a**

Interview	
Empowerment	10
Ethics	9
Efficiency	6
Enhancing Quality	9
Encouragement	9
Enabling	9
Evidence Based	4
Education	7
Extending	5
Equity	7

Improvements (HOT-FIT)/ Eysenbach	7. **What do you believe is the best way to improve the engagement of the portal for the users?**	Get them access to conversation, whether that's community, heath care providers, give them a reason to keep coming back over and over again and I don't see any way to do it without social interaction. The tools are really important but won't use it unless people have a reason to go to the site in anyway.	**Service quality**

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Interview #3: Nurse/ diabetic educator

Category	Questions	Answers	Analysis
Introduction Introduction	1. Could you please introduce yourself? 2. What is your function within the company?	My name is … . I'm an officially registered nurse and a diabetic educator started here in December. Prior to that I was coordinator of the first diabetic program, which is a regional program. I've worked all over the province as a diabetes nurse, in my previous job; we also did a portal project. So that's where I got my interest into technology health care piece. So, we were working with another company to build a demonstration project for a portal. For diabetes care, it didn't give our initiative because of the privacy and all of that piece. But it was a nice baby project to and I would've loved to see it go forward. But this came up and I said, maybe it's time to look at if officially.	n/a
Introduction	3. What is your relation with the portal/Live well coaching?	Health coach.	**Profession**
Introduction	4. How do you like working with the program (in general)?	It's such a small group, that's fun. And it is such a new project that is definitely different. Because before we had to rechange and update and renovate. And that way we looked at health care and technology. So that's the exciting part. Patients, I don't have a lot of patients yet, but the ones we work with are some interesting in a different way from professional perspective, very different way of interviewing patients with clients. So in such a different way than the traditional health care system. F: What's your opinion about that? N: I think for some people that works very very well. And I think	n/a

Master thesis Health Sciences: Freek Hertman, 2013

		for some people it won't be appropriate at well.	
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	I think a little bit more about update; we need to have more user friendliness. It looks nice at the beginning, but we start in the clinical perspective. Being the new log, new vans. It's just the way the framework is there that needs to be easier to use and easier to read. One of the things that sure is coming, with the next upgrade, is the ability for things like video clips. So much more of an interactive portal. Definitely it needs to be more interactive. That interactive piece could be used to assess peoples knowledge, so you could build a, almost like a lessons map, when you go through it, there's a quiz, and that little quiz can be developed to be an in designated tool.	**User satisfaction** **Information quality**
Eysenbach 10'es	6. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, What is e-health?)**	<table><tr><td>**Interview**</td><td></td></tr><tr><td>Empowerment</td><td>9</td></tr><tr><td>Ethics</td><td>10</td></tr><tr><td>Efficiency</td><td>10</td></tr><tr><td>Enhancing Quality</td><td>10</td></tr><tr><td>Encouragement</td><td>9</td></tr><tr><td>Enabling</td><td>10</td></tr><tr><td>Evidence Based</td><td>10</td></tr><tr><td>Education</td><td>10</td></tr><tr><td>Extending</td><td>10</td></tr><tr><td>Equity</td><td>10</td></tr></table>	
Improvements (HOT-FIT)/ Eysenbach	7. **What do you believe is the best way to improve the engagement of the portal for the users?**	Get their feedback, get their input. Focus groups. Listen to each user and evaluate what they are telling us and continue to build. F: Do you have a solution for it? N: For the portal? Yes, this is what the second stage level and I think we have plans for changing. It is a never ending change. And that's probably the downside of using technology.	**User satisfaction**

Master thesis Health Sciences: Freek Hertman, 2013

Interview #4: Nutritionist/ dietician

Category	Questions	Answers	Analysis
Introduction Introduction	1. Could you please introduce yourself? 2. What is your function within the company?	I am a registered nutritionist, which means that nutrition is my field. I have been doing it for ten or more years. During the entire time I have worked in the field with diabetes. Certainly over the course of my career I have started to recognize that just telling people what to do has very little effect. Most people know a lot about nutrition actually, it is kind of trendy now, everybody is writing books about nutrition right. Everybody has opinions about nutrition but where people get stuck is actually making change in their lives. We all know that you should not eat chips every night while you are watching TV but it is hard quitting and doing something else, that has become my focus in my career. I would call myself a food coach. So when I heard about the portal it was kind of a nice fit because coaching has become their focus as well and diabetes of course. So that's my background. So that's a little bit about me, I could go on and on, how much do you want to hear? F: That's enough for now.	**Profession**
Introduction	3. What is your relation with the portal/Live well coaching?	I was the first coach to be on site and helping through the summer. So at that time I was acting as what they call the lead coach while we were trailing the whole coaching process. Now that we have Nancy here. Have you met Nancy? F: Maybe I just met her but I don't know. 2: So … is now functioning as the head or lead coach and I am strictly the food coach. So if a client wants help specifically with nutrition and food than they get to chat to me.	**n/a**

Master thesis Health Sciences: Freek Hertman, 2013

		F: So your relation with the portal is that you are the nutrition coach and everything with food is for you. 2: That's right. I use the portal as a way of delivering steps to a client, for example if I want to give them.. you know in the old days they had a paper handout you could just give to the person. Now I will put it in to the library on the portal and alert my client that there is something I want them to look at on the portal or if I want to know what they are eating I get them to type it in to the portal and then I can see it. In the absence of sitting in a room together it is my way of getting information back and forward between the two of us.	
Introduction	4. **How do you like working with the program (in general)?**	It has been good. It has been a bit of an investment but it has been fun to think those varying things through. How would get something into my client plans. I could put it in the library or I could direct him to a website. I have enjoyed that challenge. Learning how to do nutrition counseling in a different way when you are not sitting together in a room. I guess the big job during the summer was that it was always sad for me that I was so keen and engaged in the portal but the other half, the client, was not so much engaged. So every day I would log on to see if anyone had left me a message, sending messages out. How are you doing? Are you having protein in your breakfast? F: So you were doing that, trying to get interaction with the client. 2: Yes, I would log on to see if they had A: received my message and B: written back. Nothing. So that was the greatest disappointment, I was keen to start using the portal to	n/a

		its max and the clients weren't so much.	
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	Well I don't know if this is to fine of a detail but this morning for example I have a client who specifically asked me to come up with a menu for her, like actual food for a whole week. So I entered that to her nutrition menu planning feature and she was able to see it on her home-computer but she can't print it. She wants to print it off so she can put it on the fridge and work from it. And she can't at this point. That was kind of a disappointment. Again this is kind of a fine detail, I don't know if that's too. So she had to go down to her computer and look to see what she is supposed to be eating Monday afternoon for snack and then run back upstairs to her kitchen. That's not very functional for her. So these are little things that need to involve with the folder.	**Information quality**
			Service quality
		And the other thing I suppose that we talked about a lot this summer is.. I understand for security purposes that we are writing back and forward with our clients within the portal. But I think what people really want is for me to write to them via e-mail. They want it in e-mail. And actually sometimes if I haven't heard from a client and I can see they haven't logged on to the portal at all, I will actually write them to their e-mailadress. I would say, Hey it is Polly, haven't heard from you. Nothing but helpless information. And then once they have got my e-mailadress that's how they want to communicate. They engage me all the time by e-mail and getting them over to the portal . It is a very interesting thing, disconnect something going funny with the clients if they	**Service quality**

Master thesis Health Sciences: Freek Hertman, 2013

		don't want to take the step to go into the portal and message me that way. F: So something else is fine? 2: Uhu, Email is so easy. You have got it on your phone or you always have got it up and running on your computer.		
Eysenbach 10'es	6. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, What is e-health?)**	<table><tr><td>**Interview**</td><td></td></tr><tr><td>Empowerment</td><td>8</td></tr><tr><td>Ethics</td><td>6</td></tr><tr><td>Efficiency</td><td>8</td></tr><tr><td>Enhancing Quality</td><td>7</td></tr><tr><td>Encouragement</td><td>6</td></tr><tr><td>Enabling</td><td>7</td></tr><tr><td>Evidence Based</td><td>5</td></tr><tr><td>Education</td><td>5</td></tr><tr><td>Extending</td><td>5</td></tr><tr><td>Equity</td><td>6</td></tr></table>	**n/a**	
Improvements (HOT-FIT)/ Eysenbach	7. **What do you believe is the best way to improve the engagement of the portal for the users?**	I think if that if linking it to the computer functions that they already use, so e-mail comes to mind. So we can be in more constant presence in client daily round. So if I send a message I want them to be alerted about that. rather than you know, 5 days later they finally log on the portal; and see like, oh Polly wrote me something. I want to be more in their face, so getting into their smartphones or their e-mail they check in regularly.	**Service quality**	

Master thesis Health Sciences: Freek Hertman, 2013

Interview #5: Software engineer

Category	Questions	Answers	Analysis
Introduction	1. Could you please introduce yourself?	My name is …, I graduated from university of waterloo with a softmore engineering degree in 2007. I've been working with computers since 1997 I've started off website developing for a variety of corporate clients. From there, moved on into assembly therapy working with a small group who helped with wireless routers and approximately redeveloped a small operating system, like hardware. From there it was a number of co-op jobs at university and alternately ended up working here at Medmanager as a software engineer for their medical device application.	n/a
Introduction	2. What is your function within the company?	Most of the work that I do, deals primarily with the entire spectrum of webdesign. From database design to the business logic and finally front end logic, which faces our patient. So, that would be what I am and what I've been up to.	Profession
Introduction	3. What is your relation with the portal/Live well coaching?	My relationship to the portal is, I arrived on the team in 2007. It was a product that was built I believe since 2001/2002. It's been migrated forth and then I took over when the previous technical lead left the company and I've been dealing with all of the technical coding aspects of the application. That would be managing the database-structure, the thema, the immigration, dealing with the fist and logic in as much as creating new features and functionalities for external applications, dealing with client relations and net regards. Also dealing with the design of front-end user experience, as well as the data validation. So that users don't answer incorrect data. I've been	n/a

Master thesis Health Sciences: Freek Hertman, 2013

		doing art direction as well, for the site specifically coming out with color choices, which were some US style software. Working with the rest of team, trying to figure out how to make it until the system has common points. Where if you learn one module, you'll effectively learn them all.	
Introduction	4. **How do you like working with the program (in general)?**	It's interesting. It's challenging because it's a legacy system that been moved forward over the years. So it has its own unique idiosyncrasies, but having the ability to work with a product from the very low level of design to user varies end design clients facing parts of it. It's a very rewarding activity. Because you can dream something up one day and see through your fruit just by yourself, instead of having to deal with a tiny fraction of a small project. So this is actually an enjoying job.	n/a
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	We could do more studies into how are users reacting to the portal. E.g. giving them a task to do and then through a focus group observing what they actually do. So we understand their mentality instead of our mentality. Typically the site has been built with sitting back and trying to figure out what our users do or what they would like to do with the system and trying to make it simple and easy for them to perform the daily functions that they have to. But I'm an engineer and Mike is a software guy and Joe is a marketing guy, Marcus is in Q/A and marketing and all the rest of us have different views, but none of us are actually our clients. What we can do, is only estimate (03:55) so doing more focus-group related information to determine how they actually use it would be very useful in terming helping better ways the conquers	**User satisfaction** **System use**

		they have. That would be one thing. Other thing that we can do is expanding the mobile environment. Finding ways to allow our costumer to access the information on the portal or to see the portal with more data. E.g. mobile applications for the iPhone or iPad, would enable clients to on the run upload information/download information or even help …. Allow them to view the information everywhere. Which would make it all easier. Other potentials ways to improve things would be to tap in to existing complication ends such as Wacom alfa and allow nutritional information to be sent and retrieved. I know in Wacom you can type one chicken breast, two oranges and something and then it spits back one of these nutritional cards with how many calories were used, proteins and carbytes. So embedding some of the emerging technology in the industry and unique and novel ways would be and interesting way of getting more useful information to our clients. So that would be a few of the things we could take on.	**System use**
Eysenbach 10'es	6. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, What is e-health?)**	<table><tr><td>**Interview**</td><td></td></tr><tr><td>Empowerment</td><td>10</td></tr><tr><td>Ethics</td><td>10</td></tr><tr><td>Efficiency</td><td>9</td></tr><tr><td>Enhancing Quality</td><td>9</td></tr><tr><td>Encouragement</td><td>10</td></tr><tr><td>Enabling</td><td>8</td></tr><tr><td>Evidence Based</td><td>7</td></tr><tr><td>Education</td><td>10</td></tr><tr><td>Extending</td><td>8</td></tr><tr><td>Equity</td><td>5</td></tr></table>	**n/a**

Master thesis Health Sciences: Freek Hertman, 2013

Improvements (HOT-FIT)/ Eysenbach	7. What do you believe is the best way to improve the engagement of the portal for the users?	I would say ease of use, so user experience.	System use

Interview #6: Vice President

Category	Questions	Answers	Analysis
Introduction	1. **Could you please introduce yourself?**	…, I am vice president of director of marketing. My career actually started in 1997 public relations firm, lobbying firms. Lobbying can be a dirty word. I was research assistant and after several months I went the political staff and I was mend to be the liaison for the manager of health. The liaison works with offices and MTP offices to provide program and information to the public. And from there I switched over to become a policy advisor at management board of the cabinet which they called the program funding deccisions of the provincial government. After that I did my MBA and following the MBA a did a course at the insurance court helping out with a number of projects and then I joined the Blackman Smith as a help policy analyst and worked for them for about 18 months. And then started with some personal tragedy and public affairs. That manager was one of my first clients and I was brought on board because they had this great technology that needed to be sold to the public healthcare sector and giving my background in public health and health related organizations and the contacts that I had and still have, that I could help some. Understand the landscape, meet the right people. Little things of all. And I continue to be involved with them. I was responsible as the regulatory fairs officer so we had to have a good quality system in place which I implemented and in October that year interviewed that on the north so that's not a responsibility for me anymore but everything else still is. F: So, you are still consultant?	n/a

Master thesis Health Sciences: Freek Hertman, 2013

		J: Yes, Technical I am a consultant but do side projects I have been doing a long project for the CDA on and off. I have been working with them for the past couple of years.	
Introduction	2. **What is your function within the company?**	Marketing, public affairs, strategy along with my divorced partners but I still do government relations. It is a small company so we all do a lot.	**Profession**
Introduction	3. **What is your relation with the portal/Live well coaching?**	Primarily I help out with portal design. I am on the frontline talking to the costumers, especially the healthcare providers. About what they like and don't like and bringing that feedback to the team to say here are some ways that we should consider improving the program. But in terms of the actual program and architecture, that is not my responsibility, not my expertise.	**n/a**
Introduction	4. **How do you like working with the program (in general)?**	Difficult for me to answer because I have a perspective of what it is supposed to do and I understand how we designed it. But it is not like I could give you a personal perspective on it. I am not sure if that answered the question. I am not really using it.	**n/a**
Improvement (HOT-FIT)	5. **What do you feel could be added to the portal to improve it in anyway?**	In many ways the portal has been designed according to what professionals think the portal should do for somebody and what an individual should do on the portal. It is not necessary well designed to accommodate human nature. We have been talking a lot about this internally recently. And we have got what	**User satisfaction**

Master thesis Health Sciences: Freek Hertman, 2013

		we would call cool features but sometimes these cool features are completely ignored by the users. In some cases it is soon that people use the portal on a regular basis, regularly flow of numbers and they are going to take the time to search out the portal and find in and do all of this work. But more and more, they won't. So the portal really needs to be simplified, with the capacity for advanced users but at its primary core we need to identify; are people really going to use it? And why do they want to use it? We almost have to start from ground zero in many ways. It has taken us 8 years to accept the fact that we may know better than consumers what is good for them but that doesn't mean that we are getting in the right product. That sounds like the old saying: that consumer knows best. So we need to simplify the portal based on what people actually want to do and what they want to extract. We have to find ways for people to update the portal or should they update their daily chart and not necessarily login to the portal. So look for ways to improve it.		**User satisfaction**
Eysenbach 10'es	8. **Could you please give your importance with the portal regarding the following topics? (Scale from 0 to 10) (Eysenbach, What is e-health?)**	**Interview** Empowerment 8 Ethics 10 Efficiency 10 Enhancing Quality 8 Encouragement 9 Enabling 10 Evidence Based 8 Education 8 Extending 9 Equity 6		n/a

Master thesis Health Sciences: Freek Hertman, 2013

Improvements (HOT-FIT)/ Eysenbach	9. What do you believe is the best way to improve the engagement of the portal for the users?	To make it easier.	System use