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Master thesis

Evaluation of the implementation of an online Quit Smoking Coach in primary care

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ENGLISH SUMMARY

Medicinfo (a Dutch health innovation company) developed a online Quit Smoking Coach (QSC). The QSC is designed to support smokers to quit, using a stepped program. Together with a Dutch insurance company and a team of GPs, a pilot project was organized to implemented this QSC in primary care to complement a face-to-face quit smoking guidance program.

An evaluation study was performed to identify success factors and barriers for successful implementation. The HOT-fit evaluation model (Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008) was used to evaluate the implementation of the QSC in primary care. This was done by describing the match between the QSC, the needs of participants of the QSC and caregivers, work processes in primary care and the goals of Medicinfo and the insurance company. To perform the research scenario-based tests, in-depth interviews and log file analysis were executed.

Research results present four main problems:

- no clear view on target group (end-users), intended use and actual use of the QSC
- the QSC and the regular guidance program were not integrated
- the QSC was not experienced as a tailored and personalized application
- the project plan for developing and implementing the QSC was incomplete

Based on these results it can be stated that the development of the QSC was expert (technology) driven, participants need caregivers to support them in self-management,

wrong way of personalization might contribute to program drop out and implementation of the QSC requires a specific financing model. Recommendations for further research are:

- a development process consisting of 6 phases based on the eHealth development framework of Gemert-Pijnen, Nijland, Van Limburg, Kelders, Brandenburg, Ossebaard, Eysenbach and Seydel (2010)
- evaluation of the improved QSC implemented in primary care, using the HOT-fit model
- an randomized control trial study on the effectiveness of the QSC
- further research on personalization of e-coaches

DUTCH SUMMARY

Medicinfo ('health innovation company') heeft de Stoppen met Roken Coach ontwikkeld (SmRC). De SmRC is een online programma dat rokers ondersteund bij hun poging om te stoppen met roken. Medicinfo heeft samen met een Nederlandse zorgverzekeraar en Het Huisartsenteam de SmRC geïmplementeerd in de huisartsenzorg in West-Brabant door middel van een pilot project. Het doel was om de SmRC aan te bieden aan patiënten van Het Huisartsenteam als aanvulling op het face-to-face programma ter ondersteuning voor stoppen met roken.

Er is een evaluatie studie uitgevoerd, met behulp van het HOT-fit evaluatiemodel (Yusof, et al., 2008), om de succesfactoren en barrières voor implementatie te identificeren. De studie geeft een beschrijving van 'match' tussen de SmRC, de wensen en behoeften van deelnemers aan de SmRC en zorgverleners, werkprocessen binnen de huisartsenzorg en de doelen van Medicinfo en de zorgverzekeraar. Het onderzoek is uitgevoerd aan de hand van scenario-based tests, diepte-interviews en log file analyse.

De onderzoekresultaten laten vier problemen zien bij de implementatie van de SmRC in de huisartsenzorg:

- Bij het ontwikkelen van de SmRC ontbrak een afbakening van de beoogde gebruikersgroep en het beoogde gebruik van de SmRC. Tevens ontbreken de loggegevens over het daadwerkelijke gebruik van de SmRC tijdens het pilot project.

- De SmRC is tijdens de pilot niet goed geïntegreerd met het face-to-face programma ter ondersteuning voor stoppen met roken

- Deelnemers aan de pilot ervaarden de SmRC in onvoldoende mate als een individueel programma dat ondersteuning op maat levert.

- Het projectplan dat is gehanteerd voor de ontwikkeling van de SmRC en de implementatie ervan in de praktijk was niet volledig

Op basis van de onderzoekresultaten kan gesteld worden dat de ontwikkeling van de SmRC 'expert (technology) driven' heeft plaatsgevonden, dat patiënten ondersteuning nodig hebben van een zorgverlener bij zelfmanagement, dat de verkeerde keuze voor personalisatie van de SmRC er wellicht aan heeft bijgedragen dat deelnemers stopten met het programma en de implementatie van de SmRC gebaat zou zijn bij een ander financieringsmodel dan Medicinfo in het pilot project heeft gebruikt. Als aanbevelingen voor verder ontwikkeling en implementatie van de SmRC en voor verder onderzoek worden gedaan:

- Doorontwikkeling van de SmRC en implementatie ervan in de huisartsenzorg aan de hand van een gefaseerd ontwikkelproces op basis van het 'eHealth development framework' van Gemert-Pijnen, Nijland, Van Limburg, Kelders, Brandenburg, Ossebaard, Eysenbach and Seydel (2010)

- Evaluatie van de verbeterde SmRC met behulp van het HOT-fit model

- Een 'randomized control trial' studie naar de effectiviteit van de SmRC

- Verder onderzoek naar de personalizatie van e-coaches en de hiervoor benodigde ICT

CONTENT

PREFACE

This research paper is the last chapter of my study Health Sciences. One of the courses of this study was about eHealth, lectured by Lisette van Gemert. I became inspired by the potential of eHealth technology for health care. At the end of course, I decided to find a topic for my master thesis within the field of eHealth. I emailed Lisette van Gemert, who suggested to contact Medicinfo about a eHealth project: the implementation of a Quit Smoking Coach in primary care.

I can now proudly say that this research paper is the result of successful cooperation with Medicinfo. Them being my 'client', I would like to thank Medicinfo first for all their efforts to support me during my research project. I would especially like to thank Bart Brandenburg of Medicinfo. You were extremely helpful to me all along the way. I would also like to thank my supervisors connected to the University of Twente, Lisette van Gemert and Robert Stegwee. Your constructive remarks on my work and encouraging words were so helpful when I thought I could no longer cope combining my master thesis and a job. I thank all my family and friends for their support this year, especially my parents. Furthermore, I say thanks to all my colleagues at Zorgbelang Noord-Holland and Medicinfo. Last but not least, I thank Harm. You watched me struggle for a second time and were supportive in every step of the way.

I hope that this research paper contributes to the development of eHealth technology in general. But I especially hope that it contributes to developing eHealth from a patients' perspective so they feel supported in coping with their disease or disability.

1. INTRODUCTION

Smoking has been known to cause severe lung diseases like chronic obstructive pulmonary disease (COPD). In 2009, 28 percent of Dutch adults (older than 14 years) smoked. 75 percent of these smokers indicated that they want to quit smoking at some point in the future (Stivoro, 2010). The most effective intervention to prevent rapid decline of lung functions and to improve a populations health in general is to quit smoking (Kanner, Anthonisen, & Connett, 2001).

1.1 METHODS TO QUIT SMOKING

However, to quit smoking is easier said than done. Fewer than half of all smokers ever achieve long-term abstinence despite having made at least three serious quit attempts (Shahab, 2009). Withdrawal from nicotine is often characterized by symptoms like headache and a craving for tobacco. These symptoms, even though temporary, are unpleasant and can increase the risk of a failed attempt to quit smoking. Supportive methods have been known to increase success rates of smoking cessation attempts (Willemsen, 2003; Zhu, Melcer, Sun, Rosbrook, & Pierce, 2000). Supportive methods to quit smoking can be divided in three groups: 1) self-help materials, 2) behavioral interventions and 3) nicotine replacement and medication (Stivoro, 2008). Self-help materials offer information about the advantages of quitting and disadvantages of smoking and offer a structured approach to quit smoking. They are usually provided as brochures or interactive applications on the internet (e.g. websites, e-mail). Behavioral interventions offer psychological and social support to people who want to quit smoking. Behavioral interventions can consist of a short advice to quit smoking by a health care professional or individual (either face-to-face or by telephone) or group counseling. Nicotine replacement and medication offer support by decreasing the

presence of withdrawal symptoms. Examples are chewing gum or patches (nicotine replacement) and bupropion or varenicline (medication).

1.2 The Quit Smoking Coach

A recently developed supportive tool is the Quit Smoking Coach (QSC, in Dutch: Stoppen met roken coach, figure 1). This is an online program designed to offer personalized and tailored support to people who need or want to quit smoking and can be used by people in their own home. The QSC is a combination of a self help material and a behavioral intervention. Users need an individual login code to gain access to their personal environment of the website. The QSC is developed and designed by Medicinfo, a health innovation company in the South of the Netherlands.

Figure 1: QSC (Stoppen met Roken Coach)

The QSC-program is divided in several steps: the preparation phase, the actual quit date, how to remain a non-smoker, rewarding yourself, difficult moments, temporary relapse and definite relapse (if applicable). During the program participants receive

personalized emails (automatically sent by the QSC on a weekly basis) and assignments based on their own profile and that correspond with the steps of the program. When participants finish the program after twelve weeks (or if they have a definite relapse and actively quit the program) the program asks them to answer several evaluation questions about the QSC. When participants successfully finish the program (they have not indicated that they relapsed before the end of the program), they receive a follow-up email after six months and another one after one year with questions about their smoke status (Medicinfo, 2008).

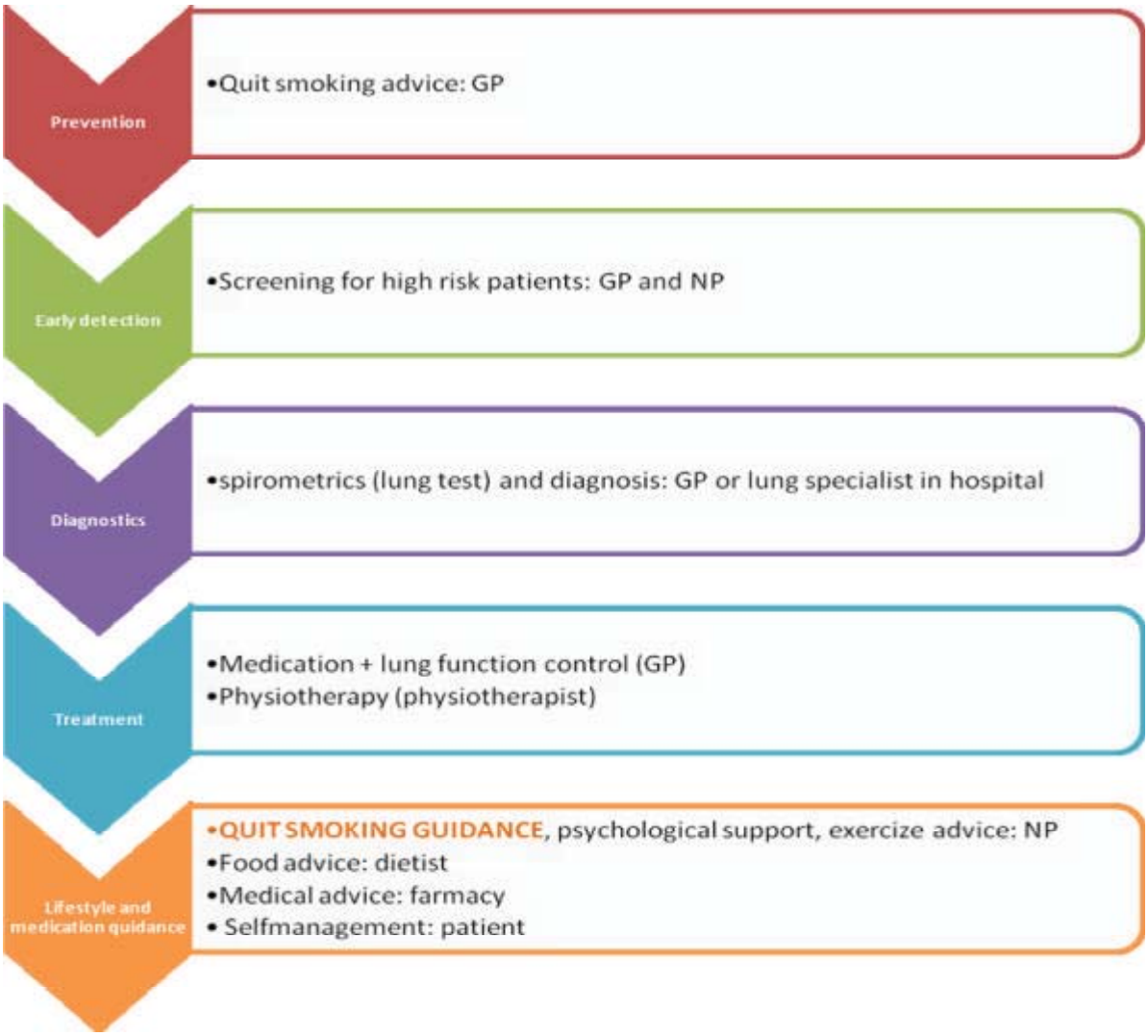
1.3 Quit Smoking Coach pilot project

The current QSC is an updated and modernized version of an earlier developed QSC by Medicinfo. Medicinfo asked its clients (mostly health insurance companies) whether they would be interested to buy the QSC to place it on their own website as a service to their customers (individual buyers of health insurance). One of Medicinfo's clients also wanted to integrate the QSC in primary health care. Therefore, this insurance company contacted "The GP-team" (Het Huisartsenteam) to organize a pilot project together with Medicinfo to integrate the QSC in primary health care.

The GP-team is a collaborative organization of almost fifty independent general practitioners in the West of Brabant (the Netherlands). Together, these general practitioners work in twenty-one locations (practices) in Breda, Etten-Leur, Ouden-Bosch, Bosschenhoofd, Hoeven, Rijsbergen, St. Willebrord, Zegge, Zevenbergen, Zundert and Rucphen (Huisartsenteam, 2010). Each general practitioner is supported by one or more nurse practitioners (NPs), who amongst other tasks provide quit smoking guidance to patients. The aim of the GP-team is to improve work processes and to develop new products. One

example is the development of an uniform COPD care path for all members of the GP-team. A COPD care path aims at cooperation between several health care disciplines within primary care and between primary care and secondary care. A COPD care path consists of prevention, early detection, diagnostics, treatment and life style and medica ti on guidance. Figure 2 shows these elements of the COPD care path and the involvement of different health care disciplines. Quit smoking guidance is part of the care path for COPD patients. During the pilot the QSC would be offered to patients to complement face-to-face support.

Figure 2: Elements of COPD care path and involved disciplines



Medicinfo added some minor changes to the QSC before implementation: a) when participants ask a question by mail, this email is not sent to the pulmonary care nurse at Medicinfo but to a pulmonary care nurse in the region of the Huisartsenteam (who would inform the NP of the patient about the contact); b) the logos of the insurance company and the Huisartsenteam where added to the lay-out of the QSC.

1.4 Research motivation and goals

Medicinfo develops applications for clients to put on their website to offer to their customers. These applications are – like the QSC – all related to lifestyle and medical topics (e.g. Diet Coach, Running Plan, Pelvic Floor Coach), but are normally not a part of a regular medical or health care process. In the pilot project of the QSC with the Huisartsenteam, the QSC becomes a part of the health care process with NPs offering the application to patients. Participants need to be patients of the Huisartsenteam in order to get access to the QSC. The QSC therefore needs to be implemented in daily health care practice. By evaluating the current implementation of the QSC in daily practice in primary care, Medicinfo hopes to identify barriers and success factors for the use of the QSC in primary care and to further develop the implementation plan.

1.5 Chapter division

Chapter 2 provides the theoretical framework that is used to focus this study. The evaluation framework HOT-fit by Yusof, Kuljis et al. (2008), which is used to study the implementation of the QSC and the pilot characteristics, is also described in chapter 2. Chapter 3 contains a description of the research questions and the methodology used to perform the research. Chapter 4 describes the results of the study and the answers to the research questions, which are subsequently discussed in chapter 5. Finally, chapter 6

provides recommendations for improving the implementation of the QSC in primary care and further research.

2. THEORETICAL FRAMEWORK

Several concepts used in this research paper originate from scientific literature. These concepts are explained in this chapter. Furthermore, an explanation is given of the application of these scientific concepts in the current context of the QSC and primary care.

2.1 EFFECTIVENESS OF INTERNET-BASED INTERVENTIONS

The concept of eHealth is referred to as *"the use of information and communication technology (ICT) to improve health systems performance"* (Nijland, 2011). It refers to many different kinds of ICT, like internet technologies (informational websites, e-consultation, online health care portals, electronic health records), virtual reality programs (serious gaming), domotica (remote monitoring, sensor technology) and robotics (surgery with use of robots).

The QSC lies within the concept of eHealth and can, more specifically, be seen as an "interactive health communication application" (IHCA). According to Murray, Burns, See Tai, Lai and Nazareth (2005) IHCAs are computer-based, usually web-based, information packages that combine a) health information with b) at least one of social support, decision support or behavior change support. IHCAs do not include face-to-face doctor-patient communication, neither are they new mechanisms for doctor-patient communication, like e-consultation. IHCAs can be used by patients in their own home and, for example, promote health behaviors, self-care and enable informed decision making. In their systematic review Murray, Burns et al. (2005) assessed the effects of IHCAs for people with chronic diseases. Their review included 24 randomized controlled trial studies (RCTs) involving 3,739 participants (adults and children). The systematic review showed that IHCAs had a significant positive effect on knowledge, social support, clinical outcomes and behavioral outcomes.

Webb, Joseph, Yardley and Michie (2010) studied the characteristics of internet-based interventions and their relation to health behavior change, such as physical activity, dietary behavior, alcohol consumption and smoking abstinence. Their systematic review included 85 RCTs involving 43,236 participants. The systematic review showed that the interventions had a small significant positive effect on health related behavior. The effectiveness of the intervention was enhanced when interventions were more extensively based on theory, incorporated more behavior change techniques and used additional methods of communicating with participants (especially short text messaging).

Above mentioned studies show the effects of IHCAs and other internet-based interventions on participants' behavior. Moreover, the study of Webb, Joseph et al. (2010), identifies characteristics that influence effectiveness, providing a framework for research that can contribute to "*a science of internet-based interventions*". These studies focus on the intervention itself, rather than the implementation of it in health care. The primary goal of this research however is not to study how the (content of the) QSC should be designed to be effective, because the development of the QSC has already been finished. The focus in this study lies with the implementation of the QSC within the COPD care path.

2.2 Implementation problems

Research in other fields of eHealth, like health information systems (HIS) and e-consulting, have already addressed the fact that problems can arise in the implementation phase. Van der Meijden, Tange, Troost and Hasman (2003) performed a systematic review, including 33 articles, identifying the problems that arose during the usage of health information systems (HIS), like computerized medical records systems and automated anesthesia record-keeping systems. In one example, information systems where withdrawn,

because physicians and nurses built up resistance due to low response time and too many screens or steps to complete order entry. Another information system was supposed to improve completeness and timeliness of data by entering data at the bedside of the patient via a terminal. Research showed that the terminal at the bedside was only used to enter specific data, such as medication. Other relevant data was entered elsewhere, because the patient or the family distracted the nurse too much. The research studies, that were included in the systematic review of Verhoeven, Van Gemert-Pijnen, Dijkstra, Nijland, Seydel and Steehouder (2007) on the contribution of teleconsultation and videoconferencing to diabetes care (including 39 publications), also mentioned several problems that occurred during implementation of the system in daily practice. Examples are: absence of adequate ICT-infrastructure, logistical difficulties in organizing online consultations with all parties having to agree on a suitable time, patients who are reluctant to cooperate or find the system too difficult to use and the choice of the technology being unrelated to the specific needs of patients and caregivers to manage diabetes. These studies show that during implementation of eHealth applications, whether they are HIS used by nurses and doctors in hospitals or communication systems enabling remote doctor-patient contact, problems can arise that influence use of the application.

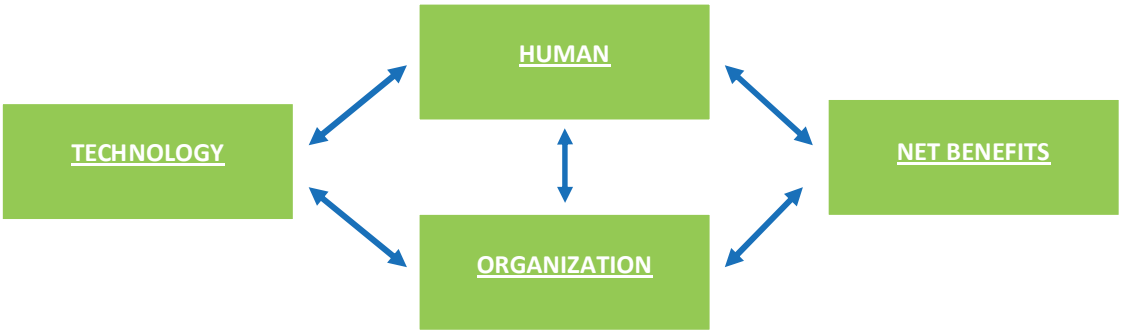
2.3 HOT-FIT EVALUATION MODEL

Often, a new eHealth initiative is almost solely developed and designed by a team of software engineers (Pagliari, 2007). Problems then arise in the next phase of the project, when this new technology is implemented in daily practice. This might be due to the gap between the contextual knowledge of patients and health care professionals, and that of the design team (Esser & Goossens, 2009). The design team has a technical background, while

patients experience symptoms and health care professionals have medical knowledge. Because of these differences in backgrounds, designers, patients and health care professionals do not always think, communicate and act alike, which affects the perspective towards a new technology. This way, there is a risk that the new technology – when solely designed from the designers perspective – does not meet user needs. The same can be said about the risk of a technology not matching with its environment, when designers do not take (work) processes and stakeholders within this environment into account while designing the technology.

In their research article on evaluation of HIS, Yusof, Kuljis, Papazafeiropoulou and Stergioulas (2008) state that human, organizational and technical factors should be taken into account when evaluating HIS implementation. These factors should have "*a mutual alignment or fit"* to ensure successful system implementation. Mutual alignment means that these three factors are interrelated and therefore influence each other. This way, evaluation shows why the new technology works well or poorly with a specific user in a specific setting (Yusof, et al., 2008). Human factors are about the actual use of the system by its users. It includes users' attitudes towards a technology, their expectations and skills and whether they perceive the system and its functions as useful. Organizational factors are the nature of the organization (e.g. type and number of patients, organizational culture), management strategies, communication, the clinical process, and the influence of other organizations (e.g. legislation, funding, complementary services). Yusof et al. present their framework for HIS evaluation as the HOT-fit model (figure 3).

Figure 3: HOT-fit model for HIS evaluation



The HOT-fit model was tested in a case study design by undertaking an evaluation to the adoption of an imaging system in a primary care organization in the UK. Results show that the right user attitude and knowledge for system use were very important factors for success. As well as persuasion by the senior GP and the alignment of IT and organizational strategy. Busy schedules and a lack of replacement made it hard for GP's to attend to training. Other barriers were slow response time of the system, a lack of communication between the IT-support team and the users of the system. Finally, use of the system had to be halted due to the fact that the system did not comply with the latest National Guidelines.

2.4 QSC PILOT PROJECT SETTING

The QSC is implemented in primary care to complement quit smoking guidance provided by the NP. Using the principles of the HOT-fit model, it can be assumed that the success of this implementation depends on the alignment between the QSC and the human and organizational factors within this specific setting. This specific setting is the (regular) quit smoking guidance program executed by the NP. The human factors within this setting relate to the NP and the participants of the QSC. The organizational factors relate to the pilot project conditions. On one hand these project conditions concern internal conditions, like work processes within the quit smoking guidance program. On the other hand it concerns

the interests and goals of Medicinfo and the insurance company and their influence on the QSC and the implementation of the QSC in daily practice (external pilot project conditions).

QSC implemented in the quit smoking guidance program

It is mostly after a visit to their general practitioner that people visit a quit smoking consult with the NP. Especially patients suffering from a lung disease are strongly recommended to quit smoking and are offered support to do so. NPs use a stepped program to guide people to quit smoking. This program is called the minimal intervention strategy (MIS). The stepped program of the QSC is also based on the MIS, because it is considered to be an effective intervention in scientific literature[1]. In general the MIS consists of seven steps (quit smoking advice, patient profile, motivation, barriers, quit date, supportive methods, follow up) which take place in about two or three face-to-face consults with a total time investment of two hours.

NPs of the GP-team were instructed to offer the QSC to every smoker that would visit their consult, regardless of where patients buy their health insurance[2]. If a person was interested, the NP would give him or her a login code to become a participant of the QSC and would add this person to the list of participants of the QSC. Next to that, NPs were instructed to ask participants about their use of the QSC in following consults (Projectgroep-

[1] RCT study: MIS (8.2 percent sustained abstinence) compared to standard treatment (3.2 percent sustained abstinence) (Pieterse, Seydel, DeVries, Mudde, & Kok, 2001).

[2] The Dutch Health Insurance Law states that every Dutch citizen is obliged to buy health insurance. As the health insurance market is a private market, customers can choose from which company they want to buy their health insurance.

QSC, 2009a). Based on the total patient population of the Huisartsenteam, the insurance company estimated that 588 people would be eligible to attend to the pilot project of the QSC (Health-care-insurance-company, 2009).

2.5 Main research question

In order to understand whether the QSC has been successfully implemented in the primary health care setting, this implementation needs to be evaluated. Using the HOT-fit framework it can be said that there should be an alignment between the QSC and both human and organizational factors. The main research question of this study is therefore:

"To what extent is there a match between the Quit Smoking Coach, the needs of NPs and participants, the quit smoking guidance program, the external pilot project conditions and what are the net benefits of the pilot project?

The next chapter describes the research approach that was chosen to answer the main research question. The chapter opens with a enumeration and description of the sub research questions. Subsequently, a description is given of the way these sub research questions were measured and the used methods for data collection and analysis.

3. METHODOLOGY

3.1 SUB RESEARCH QUESTIONS

According to the HOT-fit model, the success of the QSC will be determined by the match between human factors, organizational factors and technological factors. The main research question of this study needs to be divided in several sub research questions which enable measuring the match between the factors and to determine the net benefits of the pilot project. These research questions are:

1. *"To what extent does the QSC meet the needs of participants and NPs?"*

This research question aims at measuring the match between the technology and the human factors. Participants are the end users of the technology and NPs offer the QSC during the quit smoking guidance program. The QSC should provide them a solution or fulfill a need. Measuring to what extent the QSC meets these needs, provides input for improvement of the QSC. The needs refer to functionality (what can participants and NPs do with the QSC) and usability (is it easy and convenient to use) and subjective.

2. *"How do participants use the QSC?"*

This research question shows the actual use of the QSC by participants in an objective manner. The data about actual use complements the subjective data of research question 1 and vice versa. If participants indicate that some parts of the QSC do not match their needs this could be confirmed by underuse of those functions of the QSC or drop out after a certain period of time. Furthermore, underuse of certain functions can be explained by asking participants if the QSC is easy to use (e.g. navigation) and how they feel the functionality matches their need for guidance to quit smoking.

3. *"To what extent does the QSC align with work process within the quit smoking guidance program?"*

This research question aims at measuring the match between the QSC and existing health care process, which is an (internal) organizational factor. This research question shows whether the QSC can be successfully integrated in the face-to-face program executed by NPs and if changes are needed in work process or technology or both.

4. *"How did the financing of the QSC and the goals of Medicinfo and the insurance company with the pilot project influence the QSC and the implementation?"*

This research questions measures the match between external organizational factors and human factors. The goals and interests of Medicinfo and the insurance company influenced their strategic choices for the design and implementation of the QSC. The questions is whether these choices have lead to a technology and way of implementation that matches with the needs of participants and NPs.

5. *"How many patients that visit the NP at quit smoking consults participated the QSC between September 2009 and July 2010 and did these participants successfully quit smoking?"*

Finally, this research question measures the net benefits of the pilot project: what are the results of the pilot project in terms of participants of the QSC and successful attempts to quit smoking.

3.2 CASE STUDY DESIGN

This study has been performed by a single case study design. This means that one case has been studied in a selective period, using different data sources. The pilot project of the

QSC has not been compared to another implementation project of eHealth, neither was the implementation of the QSC on the website of the insurance company evaluated. The pilot project of the QSC started in September 2009 and lasted until September 2010. The evaluation study of the QSC was performed between May and July 2010, which is about half way the pilot period.

Swanborn (1996) states that a case study design can be used when the research goal is to collect qualitative and detailed information about one or several cases in a selective period in order to obtain an insight in barriers and difficulties (Swanborn, 1996). This fits with the research goal of this study, because a detailed description of the human, organizational and technological factors of the pilot project of the QSC can explain barriers to the success of the QSC. A downside of the case study design is the low external validity. This means that the extent to which research results can be used to describe success factors for the implementation of the QSC in a different setting than the COPD care path of the GP-team implementation, or to describe success factors for other eHealth applications than the QSC, is limited. With regard to this study, however, low external validity is not a problem because the research goal is to understand why the QSC is a success or failure with this specific user and in this specific setting.

3.3 Measuring the match

The match between human, organizational en technological factors (HOT-fit) has been measured using several variables. Yusof, Stergioulas and Zugic (2007) performed a systematic review aimed at identifying the most important factors influencing HIS adoption within the framework of HOT-fit. This means that these factors can be used to explain the success of an implementation of HIS and that they might also be suited to measure whether

there is a HOT-fit for the QSC. The variables used in this study to answer the research questions are therefore derived from the study of Yusof et al. (2007).

Research question 1

In order to determine whether the QSC matches the needs of participants and NPs the following variables related to technological factors have been measured: usefulness of QSC functions, completeness, ease of use, flexibility, the quality of data entering methods, relevance of the information shown, technical support and quick responsiveness (table 1).

Table 1: Measurement of variables related to technological factors

TECHNOLOGICAL FACTORS			RESEARCH QUESTION
T1	**Usefulness of system functions**	Participants and NPs consider the functions 'motivation check', 'intake questions', 'tools', 'assignments', 'personalized emails' as useful.	
T2	**Completeness**	Participants and NPs don't feel that any specific functions and features are missing in the QSC.	
T3	**Ease of use**	a. Participants feel that using the QSC is convenient and pleasant. b. Participants feel that font size, images and lay-out are agreeable and stimulate ease of use of the QSC. c. The amount and type of (technical) problems participants have experienced while using the QSC.	
T4	**Flexibility**	Participants feel that the QSC is a personalized program.	
T5	**Data entry methods**	Participants feel that filling out the intake questions and executing the assignments is convenient.	
T6	**Relevance of information**	Participants feel that the information available in the QSC is necessary to support them to quit smoking.	
T7	**Technical support**	Whether technical support to participants is available.	
T8	**Quick responsiveness**	Participants feel that support to using the QSC was quickly available.	

Research question 2

To achieve insight in the actual use of the QSC the following variables related to human factors have been measured: general user characteristics, participants' experience using the internet, participants' and NP's expectations of, attitude towards and motivation to use the QSC, overall satisfaction, nature, frequency, duration of use and used functions (table 2).

Table 2: Measurement of variables related to human factors

HUMAN FACTORS		
H1	**Overall satisfaction**	a. Participants would use the QSC again in the near future in case they fail to quit smoking or feel that they need support to stay quit. b. Participants would advise using the QSC to others
H2	**User characteristics**	a. Age of participants and NPs of the QSC. b. Sex of participants of the QSC. c. The extent to which participants of the QSC are addicted to smoking.
H3	**Experience**	a. General experience of participants and NPs with using the internet. b. Experience of participants with using the internet for health purposes.
H4	**Expectations**	a. The expectations of participants and NPs of the net benefits of the QSC. b. The perception of NPs to the type of patients that belong to the target population of the QSC.
H5	**Attitude**	a. The extent to which NPs base their consults on the MIS. b. Attitude of NPs to the use of ICT in health care.
H6	**Motivation**	a. The reason why participants use the QSC. b. The extent to which NPs felt motivated to work with the QSC.
H7	**Nature of use**	The situations in which participants use the QSC.
H8	**Frequency of use**	How often participants logged into the QSC after their first visit to the QSC.
H9	**Duration of use**	Average amount time participants stayed logged in while visiting the QSC.
H10	**Used functions**	Average use of the motivation check, intake questions, demo, tools, assignments, panic button, personal profile.

Research question 3 and 4

To determine the match between the QSC and the daily practice of the quit smoking consult (research question 3) and the influence of the financing of the QSC and the goals of Medicinfo and the insurance company with the pilot project on the QSC and the implementation (research question 4), variables related to organizational factors have been measured. These are: communication, champion, clinical process, management and leadership, autonomy, financing source and strategy (table 3).

Table 3: Measurement of variables related to organizational factors

ORGANIZATIONAL FACTORS		
O1	**Communication**	a. The participant's opinion about the information letter about the QSC and the evaluation study. b. Patients feel that they have received sufficient information about the QSC by their NP. c. The extent to which NPs discuss their experiences with the QSC with their colleagues.
O2	**Champion and clinical process**	a. Whether the NPs have integrated introducing the QSC in their consults. b. Whether NPs take initiative to evaluate the use of the QSC together with patients in follow up consults. c. The participant's opinion about the role of the NP as introducer of the QSC and

		promoter of the use of the QSC. d. Activities of NPs to promote use to patients who have rejected the QSC in an earlier consult. e. Patient's opinion about the combination of face-to-face consults and the QSC. f. NPs feel that it is useful that the stepped program of the QSC is based on the MIS. g. The role and responsibilities of Medicinfo in daily practice of the pilot project.
O3	**Management and leadership**	a. The way of introducing the QSC to NPs. b. The NP's opinion of how the QSC was introduced to her. c. NPs had a clear understanding of what was expected from them after the introduction of the QSC. d. The expectations of Medicinfo and the insurance company about the role and tasks of the NPs.
O4	**Autonomy**	The way in which NPs decide who they offer the QSC to.
O5	**Financing source**	a. The way the QSC project is financed. b. Whether the budget for the QSC pilot project allows for content updates, technical support and other changes to the QSC on behalf of user needs.
O6	**Strategy**	a. The target population of the QSC from the perspective of Medicinfo and the insurance company. b. The goals of Medicinfo and the insurance company try to achieve with the QSC pilot project. c. The reasons for Medicinfo to base the stepped program of the QSC on the MIS.
O7	**Competition**	The way in which the QSC differs from other websites that offer support to people who want to quit smoking.

Research question 5

Finally, to determine the effect the QSC had on the outcome of the quit smoking attempt and the quit smoking consult, the following variables have been measured: number of participants, clinical outcome, goal achievement and job effect (table 4).

Table 4: Measurement of variables related to net benefits

NET BENEFITS		
N1	**Number of participants**	Number of people who have become a participant of the QSC between September 2009 and July 2010.
N2	**Clinical outcomes**	a. Number of participants of the QSC between September 2009 and July 2010 that definitely quit smoking. b. Whether follow-up consults still take place when patients become participants of the QSC. c. Perceived advantages of the QSC compared to face-to-face consults with NPs from the perspective of participants of the QSC. d. Perceived disadvantages of the QSC compared to face-to-face consults with NPs from the perspective of participants of the QSC.
N3	**Goal achievement**	Participants of the QSC feel that the QSC sufficiently supported them in their attempt to quit smoking.
N4	**Job effects**	a. The amount of time it takes up for a NP to introduce and explain about the QSC in a consult. b. The amount of time it takes up for a NP to keep a list of participants of the QSC.

3.4 METHODS

Table 5 shows the research instruments that have been used to measure the variables shown in tables 1-4, the type of participants involved and . The three methods used in this study (interviews, scenario-based testing and log file analyses) are explained below and presented in table 5.

Table 5: Research instruments and study characteristics

RESEARCH QUESTION	RESEARCH INSTRUMENT	*N*	PURPOSE / VARIABLES	PARTICIPANTS	MEASURE NR. TABLES 1-4
1	Usability tests/ interviews	5	Motivations for use, expectations, experience, usefulness, completeness, flexibility of the system, usability problems, technical support.	Participants of the QSC	T: 1-7 H: 1, 3-4, 6-7 O: 1ab, 2ce
3	Interviews	3	Alignment with needs and work process, barriers and success factors within organization.	NPs of the GP-team	T: 1-2 H: 4ab, 5, 6b O: 1c, 2abdf, 3bc, 4 N: 2ab, 4
4	Interviews	3	Strategy and finance.	Content developer and business manager of Medicinfo. Project employee the insurance company	O: 2g, 3ad, 5-7
1, 5	Log files	46	Use of system features, user characteristics, net benefits	Pilot project participants of the QSC	H: 2, 7-10 N: 1, 2a
2		183	User characteristics	Participants of the QSC outside the pilot project (via websites of customers Medicinfo)	H: 8-10 N: 1
1, 5		31	Usability, net benefits	Participants of the QSC who finished the program or dropped out	T: 3ac N:3

Interviews

Only participants of the QSC via the GP-team could enroll in this study. NPs were instructed to ask every participant of the QSC whether they would agree to be contacted by a researcher to attend to this evaluation study by giving up their email address and/or telephone number. NPs also gave every participant an information letter about the QSC pilot project and the evaluation study (Projectgroep-QSC, 2009b).

Based on the list of participants who had given permission to be contacted about the evaluation study, participants were contacted by telephone to enroll in the study. An appointment would be made for an interview and user test in the participants' home by the researcher (LtH). Next to that, three NPs, one innovation policymaker of the insurance company, a content maker of Medicinfo and manager of Medicinfo were interviewed. All interviews consisted of a combination of open questions and closed questions with pre-formulated answers. An advantage of open questions is that participants could clarify their answers and follow up questions could be formulated during the interview. However, a disadvantage of this technique is that answers need some interpretation by the interviewer (Floyd, 2009). The interviewer made voice recordings of the respondents' answers, which were at a later time processed into a word-document by listening to the recordings and typing down the answers. For one specific question to participants ("Is there something you would like to do with the QSC, but you cannot because this function is missing?") the answers were used as input for the interviews with NPs, Medicinfo and the insurance company. This way, these respondents could react to participants' needs that involved their cooperation in order to see whether these needs are contradictory. In order to do this, the

interviews with participants were carried out first, before conducting the interviews with the other respondents.

Scenario-based tests

The interviews with participants of the QSC were combined with scenario-based tests. This is a method commonly used for describing and identifying user problems in relation to web-based applications for self-care (Nijland, 2011). The researcher used standard approaches for qualitative data, and took detailed notes during the sessions (Nielsen & Levy, 1994; Verhoeven, van Gemert-Pijnen, & Hendrix, 2010). Respondents were asked to use the QSC on a laptop with mouse of the University of Twenty. This laptop contains an integrated webcam and microphone. Every user test was recorded with MORAE 3.0 (TechSmith Corporation, Michigan, USA). The software made voice recordings and kept track of users activities on the screen. During the scenario-based tests, respondents were asked to think aloud. The researcher took detailed notes of participants activities in the QSC and the voice recordings afterwards. The study participants were asked to use the QSC based on four different tasks (scenario's), presented in table 6.

Table 6: Tasks belonging to the scenario-based test

USABILITY TEST
1: *"Your NP informed you about the QSC. Before becoming an participant of the QSC, you want to know more about the functions of the QSC and how they can support you. While using the QSC, please think aloud".*
2: *"You have tried to quit smoking before. You noticed that you gain weight when you have quit smoking. You would like to know if the QSC gives you advice on how you can prevent yourself from gaining weight in this period. While using the QSC, please think aloud".*
3: *"You have received an email of the QSC that says a new assignment is pending. Execute this assignment. While using the QSC, please think aloud".*
4: *"You are invited to a party next week. You know a lot of people will be smoking and you are worried you might not be able to resist. Send an email to an expert asking for advice on this matter. While using the QSC, please think aloud".*

These tasks were conducted to ensure that every study participant evaluated the same aspects of the QSC and needed to make use of all functions of the QSC. The tasks consisted of activities that a typical user would want to complete when using the QSC to achieve their goals. Participants needed to log in to the QSC, for which they received a test account (login name and code) by the researcher during the test. If participants were not able to move along because of a certain usability problem, this was noted by the researcher and they received support. Identified problems were addressed into one of three categories (technical, system and communication) to analyze distribution of the usability problems (Kelders, van Gemert-Pijnen, Werkman, & Seydel, 2010; Tan, Liu, & Bishu, 2009). The code book that was used for qualitative analyses of the scenario testing and in-depth interviews with participants of the QSC is shown in table 7.

Table 7: Code book utterances for qualitative analyses

CATEGORY	SUBCATEGORY	DESCRIPTION
Technical	a. Loading times b. Compatibility c. Security and privacy d. Other	a. Speed, waiting times b. Compatibility with other software/ hardware c. Log in/out function, accessibility to others than the participants d. Error messages
System	a. Navigation b. Interface	a. Being able to find information, knowing where you are in the application b. Look, feel, layout, structure
Communication	a. Language b. Personalization c. Motivation	a. Understandability, use of tone b. Tailored to the individual user c. Being stimulated to (keep) using the QSC

Log file analyses

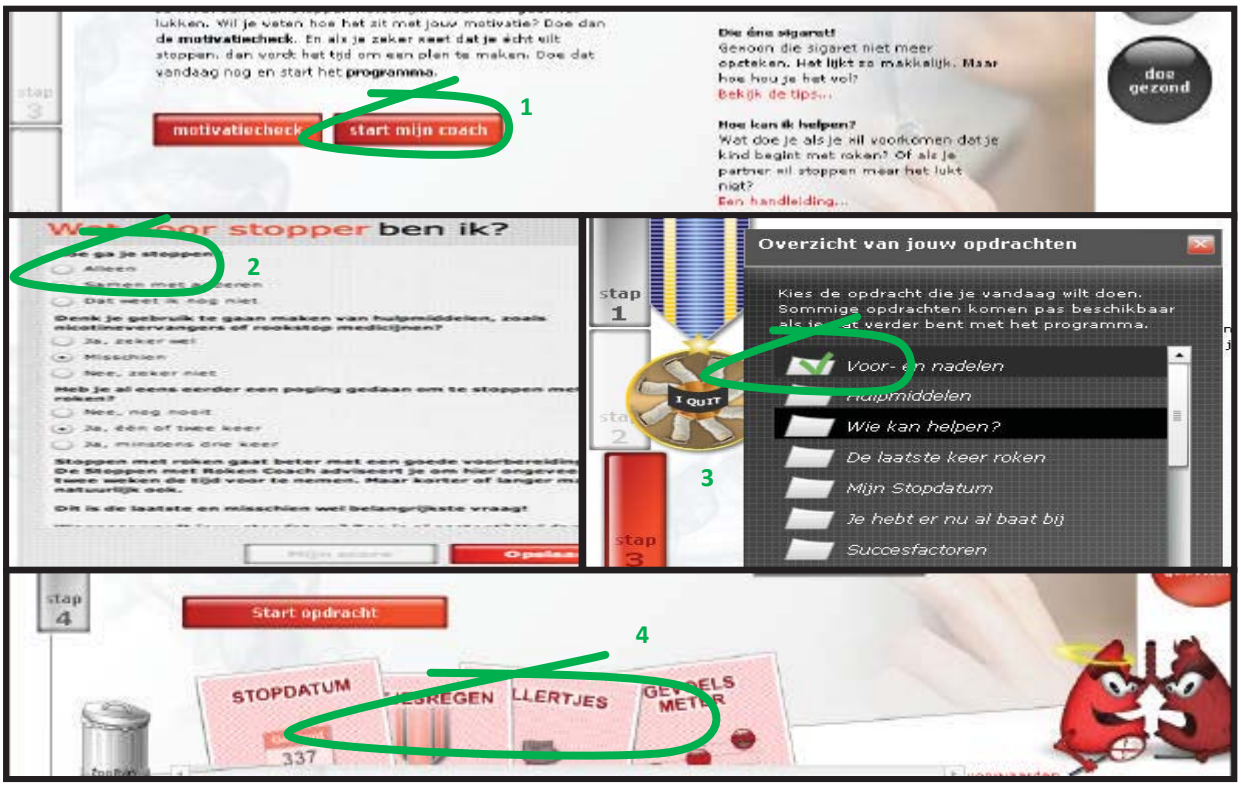
The log files of the QSC contain data about every visit of each participant of the QSC, including participants of the pilot project enrolled via the GP-team and also participants that enrolled via the website of Medicinfo's customers. The researcher had no influence on which specific activities would be logged. The log files were used to register the actual use of the QSC by participants of the pilot project. User information about the pilot group was compared to profile information on other participants of the QSC. The log files contain user

data from the 1st of September 2009 until the 18th of July 2010. Table 8 shows an overview of all data that was logged between this period and how the data was analyzed. Figure 4 shows the parts of the QSC that were logged. The numbers in table 8 correspond with the numbers in figure 4.

Table 8: Logged data and analyses

LOGGED DATA	ANALYSES
General: a. Register date (dd-mm-yyyy) and time (hh:mm:ss) (1) b. Intake date and time c. Unsubscribe date	a. First visit date to the QSC of individual participant in order to determine frequency of use b. Determine frequency of use c. Active decision point to stop using the QSC
Answers to intake questions (user profile) (2): a. Units of tobacco smoked a day (e.g. one cigarette, pipe, cigar) b. Whether participant has young children.	a. Average, number of participants smoking more than 20 units of tobacco a day. b. Percentage of total participant group.
Assignments (3): Checked assignments: shows when a participant has 'checked' an assignment, but it is possible to open and execute an assignment without actually 'checking' it.	Percentage of total participant group that checked one or more assignments.
Tools: Usage of mood box (4)	Percentage of participants that entered one or more values in the mood box.
Answers to evaluation questions: Any comments about the QSC	Categorized according to the code book (table 7)

Figure 4: Logged parts of the QSC



4. RESULTS

In this chapter the results of the study are presented. A description is given of the user population of the QSC, the actual use, the perceived usability and opinions about the QSC's functionalities, the way the QSC is integrated in the face-to-face consult and the results of the pilot project when looking at the number of participants that have quit smoking. Finally, the sub research questions and the main research question are answered.

4.1 User population of the QSC

Each participant of the QSC needs to fill out the intake questions in order receive personalized advice and emails. These intake questions are divided in three categories, (which participants all needed to complete) an overview is given in table 14 (appendix III). Log files show the answers of each participant on the intake questions. Demographic information (like gender, age, education level) was no subject of the intake of the QSC and is therefore not available. Based on the intake question 1b (appendix III) *"How many units of tobacco do you smoke a day?",* the pilot population (n = 46) was compared to participants outside the pilot project (n = 183). Results show that on average pilot participants smoke 23 units of tobacco a day, which is slightly more (but not statistically significant) than participants outside the pilot project (average of 20 units of tobacco a day). However, the pilot group consists of a larger part of heavy smokers[3] compared to participant group outside the pilot project: respectively 58% compared to 32%. The results are presented in table 9.

[3] Smokes >20 units of tobacco a day, which is more than 1 package of cigarettes a day.

Table 9: Characteristics of the population of the QSC

CHARACTERISTIC	PILOT POPULATION (N=46)	PARTIPANTS OUTSIDE PILOT PROJECT (N=183)	CHI SQUARE	T-TEST
Percentage of heavy smokers (=20)	58%	32%	0.00139[a]	-
Average units of tobacco a day	23	20	-	0.089[b]

a) P < 0.05; b) *P* > 0.05

NPs, Medicinfo and the insurance company were asked to describe the target group of the QSC. NPs were also asked how they decide who to offer the QSC to. Participants (n = 5) were asked how often they use the internet and what their motivation was to use the QSC. Finally, using the log files participants' answers to the question *"do you have young children?"* was analysed in order to retain an indication about the age of the participants. Results are shown in table 10.

Table 10: Influence of NP's perception on offering QSC

TARGET POPULATION (MEDICINFO)	NP'S PERCEPTION OF TYPICAL QSC USER	ACTUAL USERS OF QSC (PILOT)
Characteristics: - Age between 18-80 years - Average smokers - Experienced internet users	Characteristics: - Experienced internet user - Young person, but internet skills are more important - Likes to explore new computer programs Not offered to old people, because they : - are inexperienced internet users - need face-to-face contact - can get stressed by using the QSC	Characteristics: - mostly[4] older people - experienced internet users - mostly heavy smokers Motivations to use the QSC: - need for support - you can use it whenever you need it - curiosity

The QSC was offered to patients of the GP-team who more or less fit the perception of the NP of a typical QSC user (internet skills; fond of exploring new computer programs). NPs indicate that age is less important than internet skills, but when a patient is old they are

[4] The users' age is not asked during the intake of the QSC and is therefore unknown. However, log files show that 72% of the pilot participants filled out that they do not have young children (table 9, question 3d). This indicates that a large part of the actual pilot users of the QSC could consist of older people.

reticent to offer the QSC. This means that in some cases the QSC is not offered to old people even though they might be interested in using the QSC and despite the fact that NPs were asked to offer the QSC to every patient that visits their consult (Projectgroep-QSC, 2009a). Medicinfo indicates they designed the QSC to match all adult Dutch people (as they belong to the target population of Medicinfo's customers), instead to match the specific population of users coming from the GP-team. The insurance company was not involved in the choice for a specific target group.

4.2 Actual use of the QSC

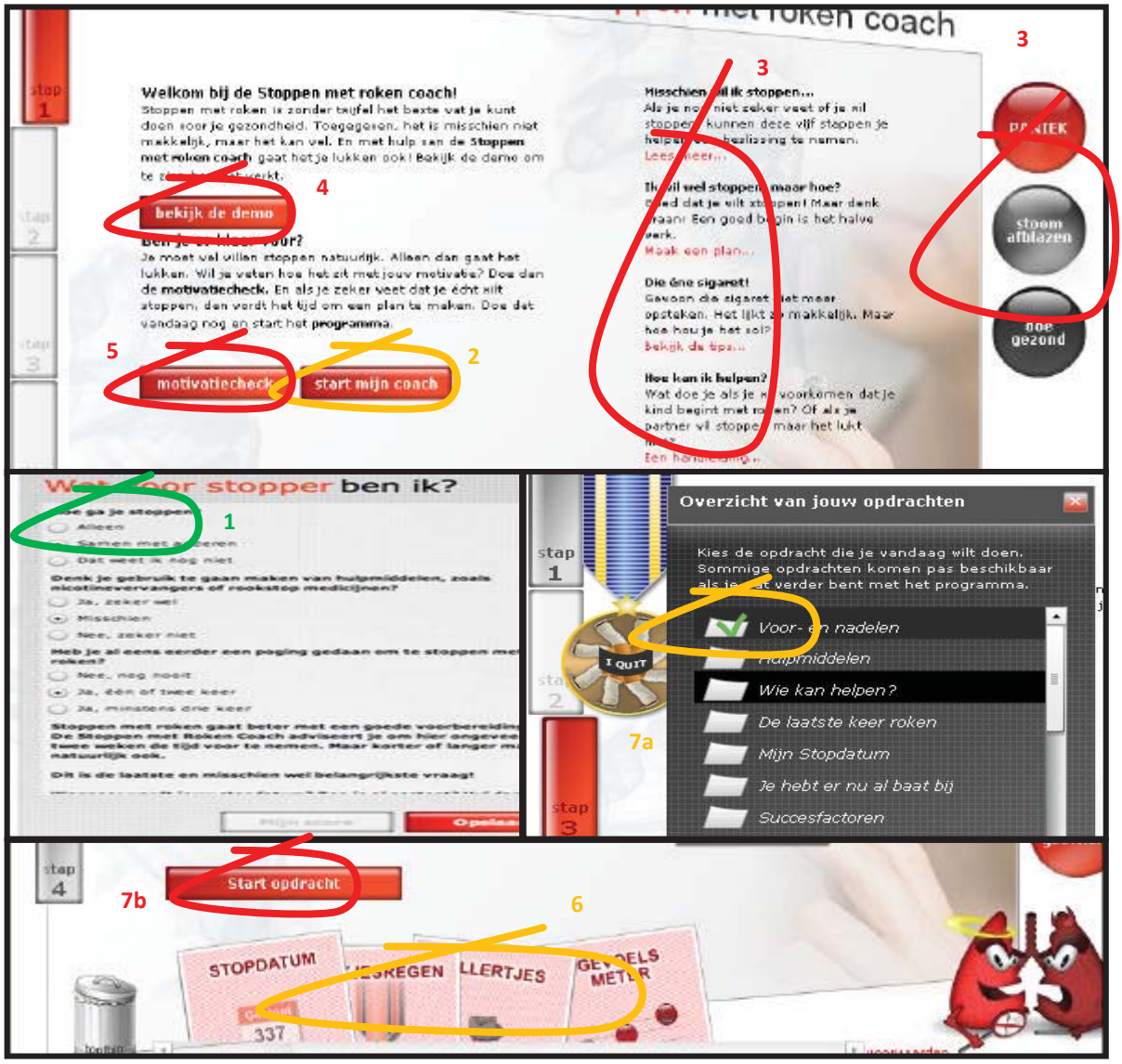
While preparing for the first release of the QSC, Medicinfo decided only to log a few functions of the QSC and to start logging the rest of the program from the second release on (Medicinfo, 2008). Figure 5 and table 11 show which parts of the QSC were logged (green circles), which were partly logged (orange circles) and which data were not logged (red circles).

Table 11: Necessary log data compared to logged data during pilot project

VARIABLE	NECESSARY LOG DATA	LOGGED DATA DURING PILOT PROJECT
General user characteristics	- Age - Sex - Education level - Number units of tobacco a day (1)	Participant's answer to: - number units of tobacco a day (1) - all other intake questions (table 9) (1)
Frequency of use	- Date of every time participant logs into the QSC	- Registration date (dd-mm-yyyy): first time a participants logs into the QSC (2)
Duration of use	- Time of every log into QSC (start of use) - Time of every end of visit to QSC	- Registration time (hh:mm:ss): first time a participant logs into the QSC (2)
Used functions	Every click on: - information buttons and links (3) - demo (4) - motivation check (5) - tools: quit date, ribbon party, counters, mood box (6) - assignments (opening without checking) + checking (7a + 7b)	- Mood box: date (dd-mm-yyyy) and filled out values (6) - Every checked assignment (7a)

Results show that only a few parts of the QSC were logged (figure 5): all answers to the intake questions (1), date (dd-mm-yyyy) and time (hh:mm:ss) of the registration (2), date use of the mood box (dd-mm-yyyy) and filled out values (6), every checked assignment (7a). Logging of these specific parts provides either irrelevant information or only a part of the information that is needed to analyze actual use of the QSC and the actual user. For example, duration of use cannot be determined because only the time of the first log in moment was logged (e.g. 4:45:23 pm). To determine the duration of use, the time of every

Figure 5: Logged and not logged parts of QSC



log in and the time of the end of every visit should have been logged (e.g. log in: date 03-08-2010 time 2:23:56 pm, log out[5]: date 03-08-2010 time 2:48:25, duration of use: 24 minutes and 29 seconds). Of the functions of the QSC only the assignments checked (figure 5, circle 7a) and the use of the moodbox (figure 5, circle 6, 'Gevoelsmeter') were logged. Table 12 presents the results of the log files analysis on 'checked' assignments.

Table 12: Log file analysis 'checked' assignments

NUMBER OF ASSIGNMENTS 'CHECKED'	BY NUMBER OF PARTICIPANTS
16	1
5	2
3	1
2	1
1	2

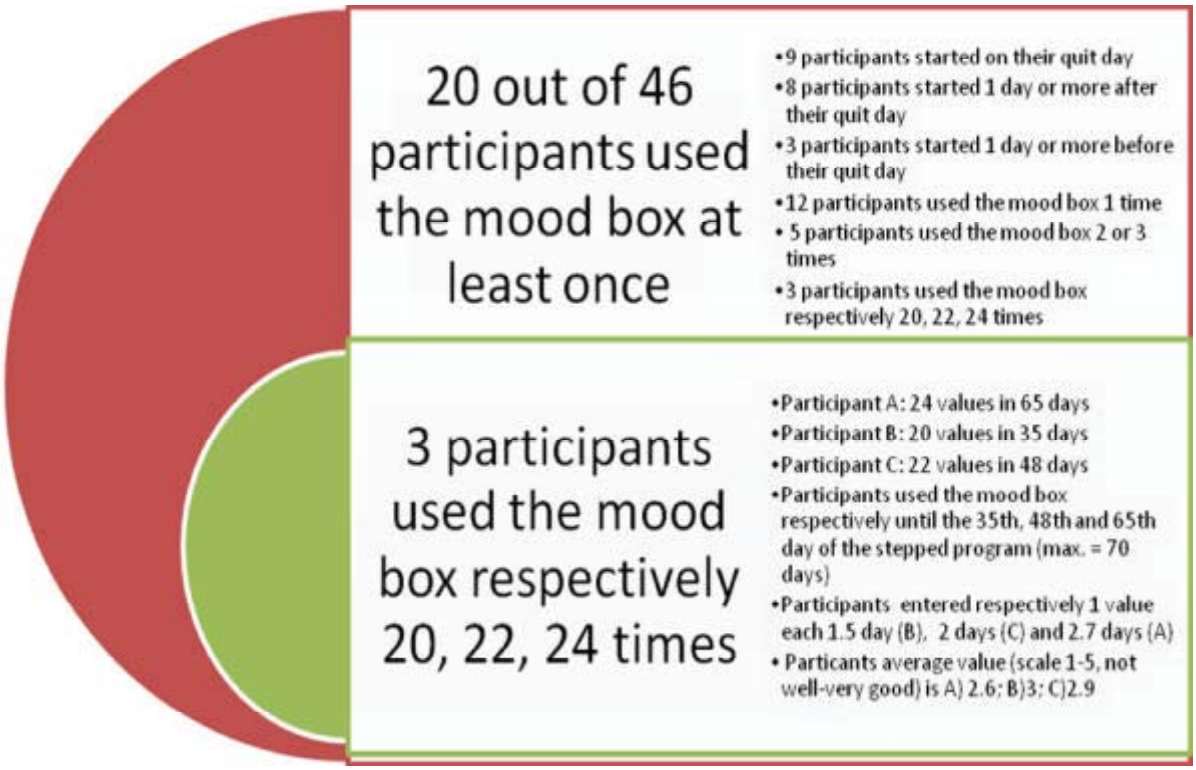
ASSIGNMENT TITLE	'CHECKS'	ASSIGNMENT TITLE	CHECKS'
1. Pro's and Con's	4	12. How much did I save?	0
2. Supportive methods	3	13. What if I cannot resist	1
3. Who could help me?	1	14. Food and exercise	1
4. The last smoke	5	15. A better physical condition	1
5. My quit date	4	16. Helping others to quit	0
6. You are already benefitting	1	17. What should I expect for the next months?	5
7. Success factors	2		
8. Withdrawal symptoms	2	18. Do you often think about smoking? (1)	1
9. Difficult times	2	19. Do you often think about smoking? (2)	0
10. How is your stress level?	1	20. Too bad! You could not resist	0
11. What behaviour am I going to change?	1	21. A new attempt (1)	0
		22. A new attempt (2)	0

Results show that only one participant checked a majority of the assignments: 16 out of 22 (table 12). Assignments 1, 2, 4, 5 and 17 (table 12) were checked most often: by 4 or 5 participants. These results do probably not reflect the actual use of this functionality of the QSC. Participants can read and execute assignments without having to check them after finishing. This means that participants might have used the assignments a lot more, than is reflected by the log files.

[5] It is not possible to log out of the QSC, therefore the closing of the window could be seen as the end of a visit

The use of the mood box was also analyzed based on the log files: date (dd-mm-yyyy) and entered value (scale 1-5 = not well-very good). Results are presented in a factsheet (figure 6).

Figure 6: Log file analysis use of mood box



Analysis shows that 20 out of 46 participants used the mood box at least once. 3 participants started entering values in the mood box one day or more before their quit day, 17 participants started entering values on their quit day or at least one day after the quit day. 17 participants used the mood box only 1-3 times, 3 participants used it respectively 20, 22 and 24 times. The logged data of these three participants (A, B, C) were further analyzed (green box, figure 6). Participants A, B and C started entering values on their quit day, which means that the stepped program of the QSC continues at that point for another 70 day (10 weeks). The date of the first entered value was counted as day 1, the rest of the dates were counted likewise (e.g. day 1: 6 September 2009 - value 3, day 2: 9 September 2009 - value 2,

day 5: 12 September 2009 - value 4). This way, results show that participant A entered values until the 65th day (average value 2,6), participant B entered values until the 48th day (average value 3) and participant C entered values until the 35th day (average value 2,9).

4.3 USABILITY AND FUNCTIONALITY OF THE QSC

A scenario-based test was performed to detect user problems the QSC. The tests were combined with in depth interviewing about the different functions of the QSC, like the personalized emails and assignments, and whether there was technical support in case a problem occurred. Participants and NPs were asked a) if they considered the functions of the QSC to be useful and b) if they felt the functions needed improvement. NPs were also asked these questions in order to find out if the QSC meets their needs and in case they have received feedback from their patients on the usability of the QSC. Furthermore, both participants and NPs were asked if there was something they would like to do with the QSC, but could not because of missing functionality. When participants answers regarded functionalities that involve cooperation of NPs, these answers were used as input for the interviews with NPs. NPs were then asked if they feel the participants suggestion is feasible and matches with their own needs. Medicinfo was invited to respond ("Would you consider changing this part of the QSC?") to the perceived shortcomings of the QSC by participants that might involve complicated (and therefore costly) changes to the QSC. The insurance company was asked the overall question of whether they would consider investing in the QSC if the results of the current evaluation study showed that the QSC needed important improvements. Finally, log files were analyzed for answers of participants (n = 20) on the evaluation question *"Do you have any general comments on the QSC?"*, which mentioned missing functionalities and usability problems. Table 13 presents the mentioned usability

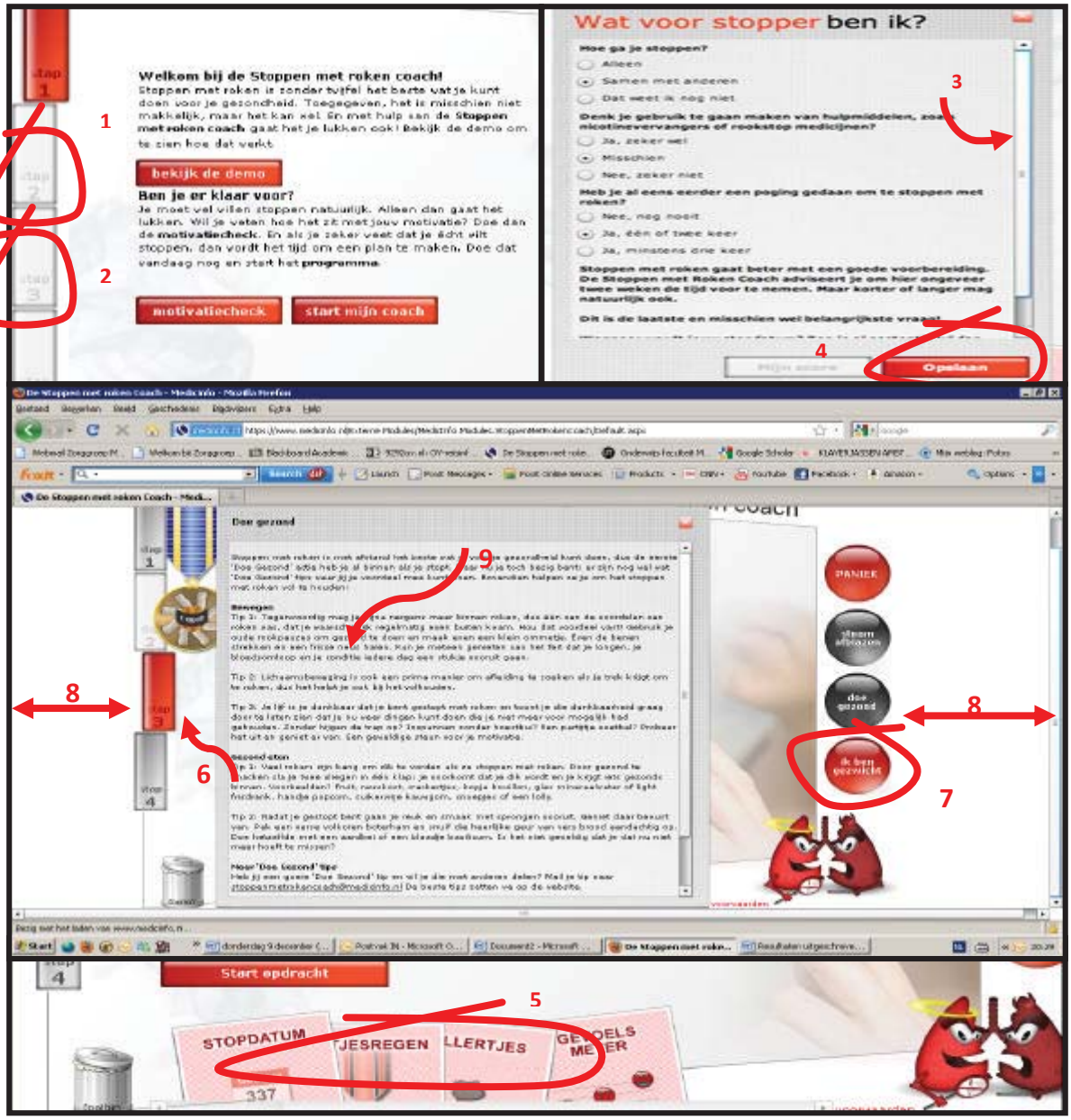
problems with numbers referring to the specific problems in figure 7. Table 14 gives an overview of participants' appreciation of the functions of the QSC, the missing functionalities and the response of NPs, Medicinfo and the insurance company to these perceived shortcomings of the QSC by participants and NPs.

Table 13: Overview of usability problems

CATEGORY	SUBCATEGORY (NR. FIGURE 4)	*N*
Technical	**a. Loading times**	
	- Long loading time of the start page.	2
	- Long loading time of an assignment.	1
	b. Compatibility	
	- Notification that Flash Player was not installed on the computer.	1
	- Notification that Microsoft Outlook was not the default mail service.	1
	c. Security and privacy	
	- It is not possible to log out.	1
	- Difficult log in code (combination of small and capital letters, e.g.: Kl34HNu).	4
	d. Other	
	- Error notification while opening assignment.	1
	- Stopped receiving the automatic emails after a few weeks.	3
	- Not all assignments were available after ten weeks.	6
	- Calendar tool still shows stop date after a week.	1
	- It is not possible to correct mistakes in the intake after completing all questions.	1
	- No answer to email about technical problem.	3
System	**a. Navigation**	
	- Demo opens in a separate window, causing the 'back' button in Internet Explorer to become useless as a way of returning to the previous page.	1
	- Step 2 of the program can only be reached by clicking on the button 'Start my coach', not by clicking on the tab of step 2 itself on the left of the screen (1).	2
	- Step 3 of the program can only be reached after completing all intake questions, not by clicking on the tab of step 3 itself on the left of the screen (2).	1
	- Link to QSC is hard to find on the website of the GP-team.	1
	- Unclear that not all intake questions can be shown at once (due to a small text field) (3), causing more problems:	3
	1. The scroll bar stays undetected (3).	3
	2. Red 'save' button of intake can be clicked on while not all questions have been answered (4). (A notification comes up not all questions have been answered).	3
	3. QSC does not show which question has not been answered.	3
	- After saving the intake questions the text field stays opened.	1
	- When clicking on the part of the intake questions the text field opens beneath the text field of the previous intake so it cannot be seen.	2
	- Tools are overlooked (5).	3
	- Text fields open on top of the background and each other, blocking sight of other buttons and text fields (6).	7
	b. Interface	
	- Demo is presented to small, because of the text next to the example screens.	2
	- Hard to click on a date in the calendar of the intake questions.	2
	- Folder with assignments is overlooked.	4
	- It is not possible to fill out the assignments in the QSC.	5
	- 'I have failed' button is appealing to click on and participants can easily quit the QSC by mistake (log files) (7).	4

	- Layout in general is not specious enough (8). - Fond size is too small (9).		3 4
Communication	**a. Language** - Assignments were unclear **b. Personalization** - After the intake there is nothing more to fill out about yourself. - It is not enough to use a first name in the emails. - It is a general newsletter. - The message in the emails does not align with participants' personal experiences. **c. Motivation** - Don't feel motivated to visit the QSC after an email.		 1 3 1 2 3 3
Total	- 35 % of problems was mentioned by 1 participant - 16 % of problems was mentioned by 2 participants - 49 % of problems mentioned by =3 participants	- System problems: 50% - Technical problems: 30% - Communicational problems: 20%	

Figure 7: Visual representation of problems mentioned in table 11



Scenario testing, the in-depth interviews and log files show in total 37 usability problems of which 50% are system problems (navigation and interface), 30% are technical problems and 20% are communicational problems (table 13). Furthermore, 49% of the mentioned problems were reported by three people or more. Results show that participants mostly have trouble finding information, tools or assignments and understanding where they are on the website (navigation, 1-6 figure 7). Usability of the QSC is negatively influenced by the fact that text fields open on top of each other and that buttons cannot be clicked on without taking a previous step. The QSC does not fully match with participants needs for personalization. This result is also confirmed by the interviews about the different functions of the QSC (table 14). Participants wanted the QSC to offer more personalized assignments, tools and emails. Participants do feel however that the assignments, information blocks, intake and motivation check are useful, mostly because they provide self-insight and repeat a lot of the information participants received during the consults with the NP (Column 1, table 14).

Table 14: (Missing) Functionalities of the QSC

1. PART OF THE QSC (FUNCTION)	2. PERCEIVED MISSING FUNCTIONALITY	3. RESPONSE OF NPs/MEDICINO
A) Motivation Check: Can be executed before becoming a participant of the QSC (start page). Asks the user about the motivation to quit smoking and gives an advice whether or not it is advisable proceed quit smoking considering the level of motivation. Appreciation: useful, easy and quick, provides self-insight.	**NP**: Should check reasons for motivation.	-
B) Intake Questions: Step 2 of the QSC. A mandatory part for becoming a participant of the QSC, because the answers are used to conduct some of the personalized assignments and emails. Appreciation: useful, provides self-	**Participants:** a) QSC should use answers to offer more personalized emails, assignments and tools. b) Feedback on this test from the NP **NP:** Should I integrate this part in my consult? If so, I would want to be able	**Medicinfo:** a) Requires large investments in technology, this is very difficult, we will only do this if all our customers will pay for it. **NPs:** b) We can do this, but we

insight, repetition of the face-to-face consult (positive characteristic).	to synchronize the answers to my computer, because I need those.	prefer it if participants mailed us a specific question as they already can do now.
C) Tools: There are four tools available: - Quit date: shows the number of days a participant has quit smoking. - Ribbon Party: participant is rewarded with a ribbon after a certain period of smoking abstinence. - Counters: Shows the amount of money and cigarettes saved by smoking abstinence. - Mood Box: Participants can fill in how they feel each day by clicking on the appropriate 'smiley'. Appreciation: fun, bit childish, complements textual parts of the QSC, it is rewarding.	**Participants:** a) Quit date: not suitable if a participant gradually wants to quit smoking, should be able to fill in each cigarette smoked. b) General: more graphs needed, more possibilities to fill out things about myself and keep track of results.	**Medicinfo:** a) We will not change this, the program does not work that way, you have to stop at once, not gradually smoke less b) We will probably do this, we are working on it for the general coach
D) Assignments: 20 assignments during the 12 week period of the QSC addressing subject like: pro's and con's of smoking, difficult situations and food & exercise. Appreciation: useful, provides self insights, more extensive than the assignments in the brochure 'Stoppen met roken. Willen and kunnen' handed out by the NP.	**Participants:** Feedback of NP on the results of assignments during the face-to-face consult.	**NPs:** We can do this, but we prefer it if participants mailed us as they already can do now.
D) Information blocks: There are information buttons throughout the various pages of the QSC about: a healthy life style, what to do if you a really craving for a cigarette or if you feel frustrated. Appreciation: useful, information is known, it is a reminder	**Participants:** The information is always the same, lacks frequent content updates.	**Medicinfo:** Content updates are scheduled in a two-year cycle
E) Personalized emails: Automatically generated emails, sent to the participant. During the first week the number of emails is the highest, this number will gradually decrease. Personalization is based on the following variables (based on intake questions): motivation, supportive methods, addiction to nicotine, individually or joint attempt to quit, previous attempts, self-efficacy (see table … for examples of personalized	**Participants:** Should be personalized based on personal experiences of participants, e.g. event noted in a diary or blog.	**Medicinfo:** Requires large investments in technology, this is very difficult, we will only do this if all our customers will pay for it.

emails). Appreciation: Too many emails, information is already known, sent without clear motivation, emails do not comply with personal situation.		
F) -	**Participants:** a) Peer contact via forum or chat room. b) Diary function.	**Medicinfo:** a) No problem from a technical perspective, but who will monitor this function? b) We can do this
G) Overall	**insurance company:** Our goal with the QSC was to gain experience with implementing eHealth in primary care. Probably no investing in the current QSC, because we are developing a more general lifestyle coach in which we will invest. Recommendations about the QSC will be taken into account. **Medicinfo:** We feel the QSC is quite nice as it is now. Further investing in current QSC only if our customers will specifically ask and pay for it. We are developing a general lifestyle coach, of which the QSC is a module but a lesser priority.	

An important finding of this study is that participants expected the QSC to be highly personalized, using information from assignments or a diary for personal feedback. Participants were not convinced by the personalized emails. These emails were constructed based on the intake questions and participants full name (e.g.: *"Dear Jan de Vries, …"*), resulting in different versions of what is actually the same email. Two examples of personalized emails sent to participants by the QSC are:

Example A, email based on weak or strong addiction to nicotine:

1) *"Do you experience any withdrawal symptoms? Are your hand palms sweaty, do you feel dizzy or shaky? The nicotine did not affect you much, so maybe you got through it quite easily? If you do experience a lot of withdrawal symptoms, visit the website for tips."* (Weak addiction to nicotine)

2) *"Do you experience withdrawal symptoms? Are your hand palms sweaty, do you feel dizzy or shaky? The nicotine definitely held you in its power, but maybe you got through it quite easily? If you do experience some withdrawal symptoms, visit the website for tips."* (Strong addiction to nicotine)

Example B, email based on low or high stress level during intake:

1) *"How do you feel at the moment? During the intake you indicated you did not experience stress at the time. Are you stressed since you have quit smoking? Many people believe they will become stressed if they quit smoking, but this is not true. Visit the QSC to find out the facts about stress and smoking".* (Low stress level)

2) *"How do you feel at the moment? During the intake you indicated you experienced some stress at the time. Are you more stressed since you have quit smoking? Many people believe they will become stressed if they quit smoking, but this is not true. Visit the QSC to find out the facts about stress and smoking".* (High stress level)

The examples show that the different versions of the email repeat a participant's answer to the intake question (low or high stress level, low or high addiction to nicotine). However, the other content of the QSC is not personalized. In the email, participants are asked a series of questions that make it clear the QSC does not 'know' their personal situation and the email tries to include several different experiences. Furthermore, the questions are very direct (Example 2: *"How do you feel at the moment?"*), but there is no possibility for participants to answer these questions either somewhere in the QSC or to the NP. Instead participants are directed to the QSC to read facts about stress and smoking, which is the actual purpose of the email. Unfortunately, participants indicated during the scenario-based test and interview that the personalized emails do not motivate them to visit the QSC. One participant said: *"I received an email which said that I was doing a great job. That made no sense to me, because at that point I had not logged into the QSC for a while. I was having a hard time so I was smoking a lot. This kind of email shows me that I am not being taken seriously."*

Table 13 shows that some of the important perceived shortcomings of the QSC by participants will not be resolved soon. Especially, increased tailoring of the QSC by improving the personalized emails is seen as a costly technological investment which requires financing by Medicinfo's customers (Row E column 3, table 14). The interview with Medicinfo and the insurance company shows that the QSC was implemented in primary care on request of the insurance company, with all partners agreeing that they would cooperate without extra

payment. The QSC was developed by Medicinfo previous to the decision to implement it in primary care. Medicinfo will not invest in the development of the QSC, unless they are paid for this (row G, table 14). Furthermore, NPs indicate they are willing to provide feedback to participants but rather use existing communication channels for this than the QSC (row D column 3, table 14).

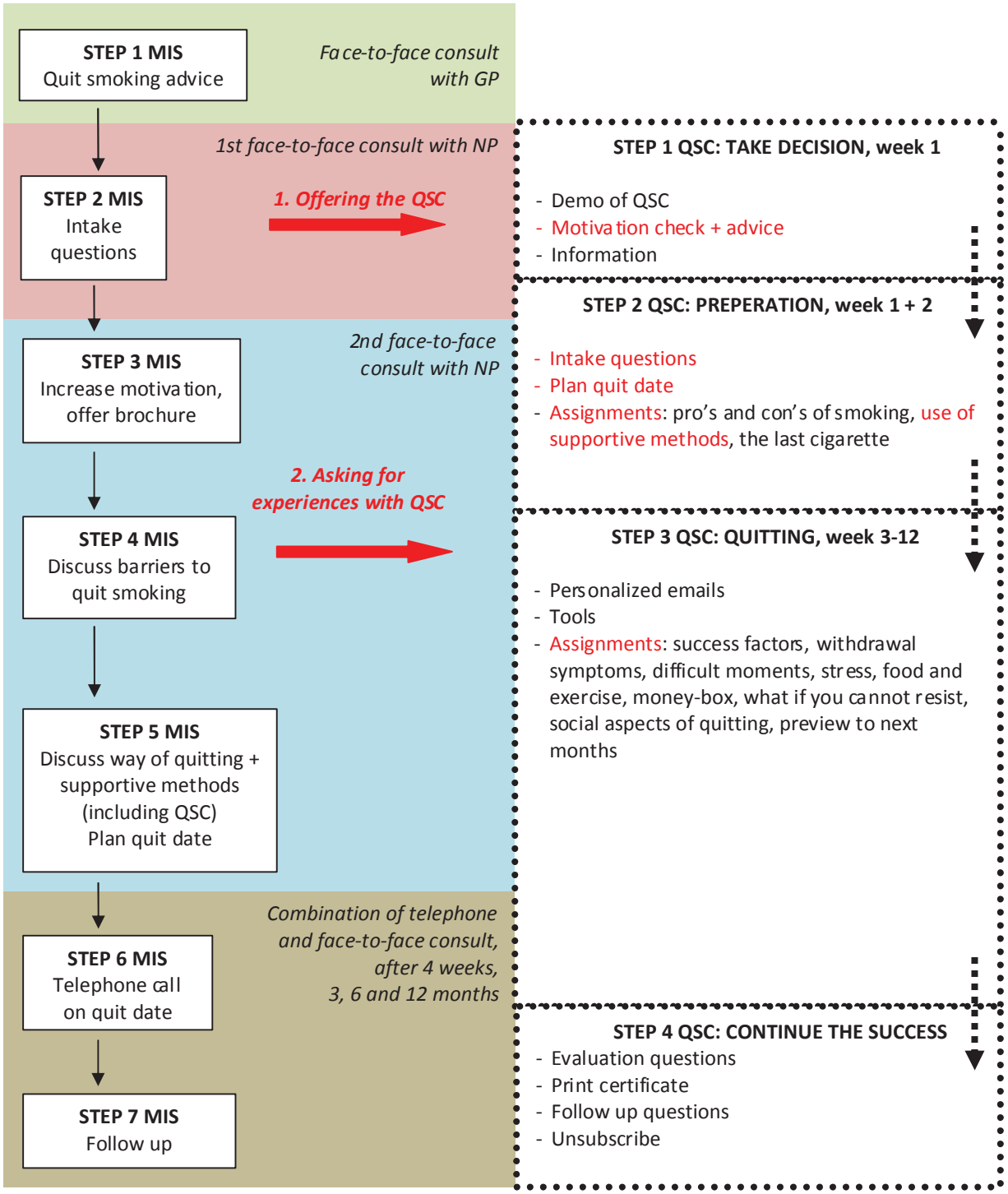
4.4 Integration of QSC and the face-to-face consult

NPs were asked how they felt about the introduction of the QSC to them, if they felt motivated after that to offer the QSC to their patients and how they integrated this in their quit smoking consult. NPs were also asked whether they use the MIS as a method for their consults and how they feel about the fact that the MIS is also the bases for the program of the QSC. Finally, NPs were invited to respond to participants' wish for feedback on the assignments of the QSC. Medicinfo and the insurance company were interviewed about the introduction of the QSC to NPs and the task they had given NPs.

Figure 5 shows the clinical processes of the (face-to-face) quit smoking consult, of the QSC and the relation between them. NPs indicate that they offer the QSC to their patients as an additional supportive method to quit smoking (red arrow 1, figure 8). When a patient is interested, he or she is handed over a log in code for the QSC. After that, the clinical process proceeds as normal, with the only addition that NPs ask their patients about their experiences with the QSC in the follow up consult (red arrow 2, figure 8). NPs received some negative feedback by their patients on the usability of the QSC, which in a few occasions de-motivated the NP to offer the QSC. Furthermore, there was no additional coaching of the NPs that related to participants' intake results or assignment results of the QSC, like participants would have liked them to do.

Looking at figure 5, and especially at the red arrows, it becomes clear that the steps of the QSC and the face-to-face consult have not been integrated well. The way the QSC is integrated in the face-to-face consult does not match with the needs of participants. Analyzing the interviews with NPs, Medicinfo and the insurance company and analyzing the

Figure 8: Clinical process of MIS and QSC



content of the QSC, three explanations can be given for this mismatch.

1. The task description given to NPs does not specifically assign NPs to discuss participants' intake results or assignment results with the QSC. Medicinfo and the insurance company state that during the introduction NPs were asked to offer the quit smoking coach on the first consult and refer to the use of the QSC shortly in each following consult. The same task description is repeated in the information letter handed out to NPs (Projectgroep-QSC, 2009a). The insurance company indicated that NPs should not invest too much time in the QSC: NPs should just ask a participant whether he or she feels that the QSC is helping in their quit smoking attempt.

2. The QSC does not involve NPs in the stepped program. The stepped program of the QSC contains all elements of the MIS (red words, figure 8) which are offered to the participant in a way that is completely detached from the face-to-face consult instead of integrated in the MIS. The QSC does not refer to the NP (e.g. "*ask your NP for feedback on your answers to this assignment*") at the end of an assignment, nor are there assignments that aim at preparing the participant for the consult with the QSC.

3. NPs do not want to monitor their patients activities with the QSC. As a response, to participants' wishes to give them feedback on the results of the intake and assignment, they said it would make them feel like they would 'check up' on their patients. NPs said they would not mind emailing with their patients, but they do not want to have to log into the QSC themselves. This means that the needs of participants might be contradictory to the needs of NPs.

4.5 PILOT RESULTS

The QSC pilot started in September 2010. Log files show that on the 18th of July 2010 there were 46 participants. This is about 8% of the initial target population (588 patients). An enquiry was made at the Huisartsenteam about the 'smoke status' of these participants[6], because the log files of the QSC could not offer this information (table 15).

Table 15: Smoke status participants QSC

SMOKE STATUS	NUMBER OF PARTICIPANTS
Quit smoking	6 participants (13%)
Smoking	14 participants (30%)
Unknown	26 participants (57%)
Total	46 participants (100%)

Results show that 13% of participants quit smoking. A randomized control study comparing the MIS to standard treatment has shown that 8.2 percent of the intervention group compared to 3.1 percent of the control group had sustained abstinence for more than six months (Pieterse, et al., 2001). Based on the results in this study it is impossible to say whether the QSC is more effective than the MIS, because a) participants of the pilot project received both support via face-to-face consults (MIS) as via the QSC and b) there is no control group to compare these results with. Results also show that there was limited follow-up: the smoke status of 26 participants is unknown. Finally, NPs were asked how much time it takes them to integrate the QSC in their face-to-face consult. They answered it does not take them more than five minutes, but that it happened a few times participants

[6] This enquiry was based on the list of participants, which consisted 35 participants while the total participant group consisted that point of 46 participants. This difference is probably due to the fact that not every NP registered their participants on the list. The number of 26 participants of which their smoke status is unknown therefore also includes the 11 participants that were not on the list.

asked them for help with user problems (difficult log in code) which did take up a lot of their time.

4.6 Answers to the sub research questions

1. *"What are the characteristics of the participants of the QSC and how do they use the QSC?"*

The pilot group consists significantly more ($p>0.001$) of heavy smokers than other participants of the QSC. Other demographics (age, sex, education level) are unknown, because this information was not asked in the intake of the QSC. This study aimed at measuring the frequency and duration of use, and the used functions of the QSC. Unfortunately, relevant data was not logged. The study results provide therefore no answer to this research question.

2. *"To what extent does the QSC meet the needs of participants and NPs?"*

Research results show that participants experience several technical, systematic and communicational problems while using the QSC. The usability of the QSC does not meet the needs of participants. NPs were a few times asked to solve user problems, which costs them extra time and lead to de-motivation. Participants feel that the QSC lacks functionalities for peer contact (forum) and that the QSC should be further personalized by using test and assignment results to conduct personalized emails.

3. *"To what extent does the QSC align with the daily practice of the quit smoking consult?"*

Participants expected the stepped program of the QSC and the face-to-face consult to be integrated. In fact, the results of this study show that these two stepped programs were

hardly integrated during the pilot project. NPs were not instructed to do so, the QSC does not facilitate integration and NPs rather communicate with participants via email because this is an existing way of communication.

4. *"How did the financing of the QSC and the goals of Medicinfo and the insurance company with the pilot project influence the QSC and the implementation?"*

The QSC was an existing program, paid out of a development budget by Medicinfo. There was no extra budget to adapt the QSC specifically to match with the GP-team. Medicinfo will only invest in technically complicated improvements if their customers will finance this. The insurance company will probably not invest, as their goal was to experiment with implementation of eHealth and the focus is now on a general lifestyle coach.

5. *"How many patients that visit the NP at quit smoking consults participated the QSC between September 2009 and July 2010 and did these participants successfully quit smoking?"*

Between September 2009 and July 2010, 46 people became a participant of the QSC of which at least 6 people successfully quit smoking. Due to limited follow-up the 'smoke status' of 26 participants is unknown. Offering the QSC is not time consuming and does therefore fit within the program of the MIS, but user problems take up extra time of the NP.

4.7 Answer to the main research question

"To what extent is there a match between the Quit Smoking Coach, the needs of participants and NPs, the regular quit smoking consult and the environment of the GP-team?

The QSC does not fully match with participants and NPs needs. The QSC lacks to facilitate peer contact and the usability of the QSC could be much improved. Furthermore the QSC does not comply easily with the quit smoking consult, which resulted the quit smoking consult and the QSC to be parallel support forms while participants like them to be integrated. The fact that all partners of the pilot project agreed to implement an existing e-coach without asking for payment means there are no incentives for Medicinfo to improve the QSC unless they are paid for it.

5. DISCUSSION

This study shows that the HOT-fit model by Yusof, Kuljis et al. can be successfully applied to evaluate the outcomes of the development process of the QSC. The method has been used to show how this specific eHealth initiative matches with this specific user and in this specific setting. The research results lead to four conclusions that are presented and discussed in the first paragraph of this chapter. Furthermore, the expert driven development approach for the QSC caused several problems, which are discussed in the second paragraph.

5.1 RESEARCH CONCLUSIONS

1. *Development of the QSC was expert (technology) driven*

Research results show that several needs of participants were unknown. For example, participants would like a forum or chat box for peer contact. Or that participants expect a highly personalized program, based on their personal experiences. The QSC contains several flaws in usability, which could have been detected previous to implementation if a group of end users had been invited to test the QSC. Medicinfo chose to base the stepped program of the QSC on the MIS in order to align it with health care. However, research results show the QSC performs as a detached program to the face-to-face consult partly because of this stepped program. While designing and developing the QSC, Medicinfo had no clear view of the needs of users and health care professionals. Moreover, research results show that the needs of participants, NPs, the insurance company and even Medicinfo itself could be contradictory. This leads to the conclusion that development of the QSC was technology driven and failed to meet the needs of participants and NPs.

2. Personalized emails send by the QSC might lead to an adverse reaction

The automatically sent personalized emails by the QSC could not convince participants that the QSC is a personalized program. Participants indicated they need personal advice based on, for example, last week's events or experiences. Instead of that, the emails were personalized based on the intake test, however still resulting in nearly identical emails for each participant. The goal of these personalized emails was to guide participants to the QSC, with the higher purpose of preventing participants to drop out of the twelve-week-program. Unfortunately, participants indicated that these emails did not stimulate them to visit the QSC and in some cases provoked feelings of disappointment and anger. Could it be that the current personalization of the emails actually leads to an adverse reaction after a while? Instead of stimulating participants to finish the program could the emails actually lead to drop out? Based on this study it is not possible to answer this question. The research results for example to not show how many participants did or did not visit the QSC right after they received an email. Log file information was lacking, but a questionnaire amongst all pilot project participants about this subject might have been useful. Furthermore, it is also unclear what is exactly 'wrong' with the content of the current emails. More research is needed and this point will be elaborated on in the next chapter on recommendations.

3. Participants need NPs to support them in self-management

User testing and in-depth interviews showed that participants liked the fact that they could work on their attempt to quit smoking in their own home. Participants liked the motivation check, intake, assignments and the fact that some of the information they received from the NP was repeated by the QSC. Actually, the QSC provided participants a tool for self-management. Self-management is about patients being capable of dealing with

symptoms, treatment, physical and social consequences of a chronic condition and the necessary changes in life style (Wagner, Austin, & Von Korff, 1996). The NPCF (Dutch Patient and Consumer Organization) published their vision about self management, stating that self-management is actually a shared responsibility of patients and their caregivers (NPCF, 2009). Caregivers need to focus on empowering their patients (e.g. information and decision support) and patients need to focus on taking control. The results of this research also that participants of the QSC wanted the NP to be involved during the twelve-week program. Participants wanted NPs to give them feedback on results of the intake or assignments they executed with the QSC. Participants expected the stepped program of the QSC and the face-to-face consult with the NP (based on the MIS) to be integrated. In other words, participants need NPs to support them in self-management. When developing and implementing a QSC for patient self-management in primary care, the role of NPs should be carefully considered.

4. *Implementation of the QSC requires a specific financing model*

The QSC was designed by Medicinfo as a business-to-business product. After the QSC was finished, the insurance company wanted to try and implement the QSC in primary care. In order to keep the costs low, all partners agreed to participate in the pilot project without payment. In order to make the QSC match with the organizational and human factors, the design and functionalities of the QSC need to be adapted which requires large investments. There is no incentive for Medicinfo to improve the QSC unless the insurance company or the GP-team are willing to finance this.

5.2 eHEALTH DEVELOPMENT FRAMEWORK

The QSC was designed at the time as a business-to-business product. The decision to implement the QSC in primary care was taken afterwards, causing the QSC not to match with the specific organization and users. The development of the QSC was expert driven, which caused four main problems and several sub problems:

1) Underuse and unintended use

Not all functionalities of the QSC (tools, assignments) were used and during implementation the QSC was not always used as intended. Sub problems are:

- No clear target group was selected, nor is there agreement between Medicinfo and NPs about the target group. The QSC was offered to patients who match NPs' criteria for the target group;
- As there is no clear target group, participants expectations and needs were not assessed. Participants need peer contact, the QSC lacks this functionality. Other features of the program are underused, because they did not match participants' needs or because of lack of usability.

2) Insufficient tailoring

While developing the QSC, Medicinfo was aware of the common need of all eHealth users for tailored en personalized technology. However, target users were not involved in the development of the QSC, so the personalization of the QSC was grounded on expert driven choices. Participants do not experience the QSC as a personalized and tailored program. To match participants' needs, a more complica ted type of technology is needed than is used in the current QSC.

3) No integration of regular care and eHealth technology

Participants expected involvement of the NP in the use of the QSC. Instead, there was no integration between the guidance program executed by the NP and the QSC, which lead to disappointment. Sub problems are:

- ✍ This type of integration was not intended by Medicinfo and the insurance company, because participants' and NPs' wishes were unknown.
- ✍ NPs were not aware of participants' expectations on integration between the regular guidance program and the QSC. NPs were not offered any training for implementation of the QSC in their guidance program. Furthermore, NPs might have conflicting interests that are a barrier for integration.
- ✍ The stepped program of the QSC does not facilitate the integration, because this was use was not intended by Medicinfo and therefore no part of the design of the QSC.

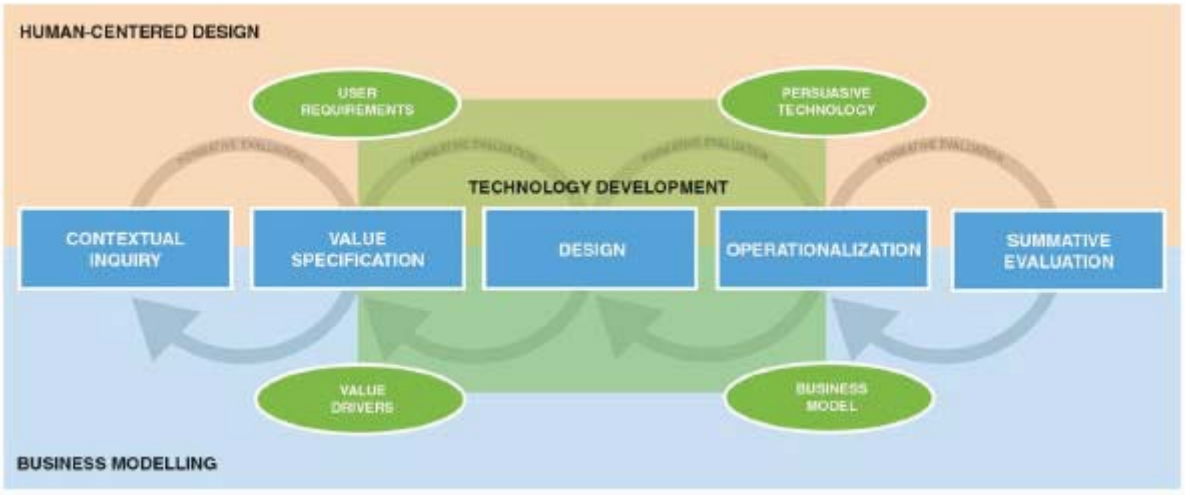
4) Incomplete project plan

The expert driven approach for developing the QSC means that participants, NPs and the insurance company were not involved in this process. Therefore, Medicinfo had no complete overview of all problems they might face, especially during implementation. Their project plan did not contain all critical elements for successful implementation, so not all risks could be sufficiently addressed and managed.

It seems that while developing the QSC important steps in the process were not undertaken. End users, NPs and the insurance company were not involved from the very beginning of the development of the QSC so the development was technology driven. To

develop the QSC as a tool that can be used in primary care, several evaluation and development steps still need to be taken. Gemert-Pijnen, Nijland, Van Limburg, Kelders, Brandenburg, Ossebaard, Eysenbach and Sydel (2010) state that implementation should be intertwined in the development process of eHealth, rather than considering it a post-design-step which is often the case in a technology driven approach. This means that developers of eHealth should start thinking about users, intended use, the organization in which the technology will be used and the intended results from the very beginning of the development process. Gemert-Pijnen, et al. developed a multi-level framework (figure 9) for the development of eHealth technologies based on several important principles.

Figure 9: Multi-level framework for the development of eHealth technologies (Gemert-Pijnen, 2010)



Firstly, development of eHealth requires involvement of the different disciplines (and therefore different stakeholders like health care professionals, patients, insurance companies, etc) that have a stake in the new initiative. Secondly, the process of the development is one co-creation. All stakeholders are in some way involved in designing and realizing the new technology. Thirdly, evaluation is integrated in the development process and has no fixed end. This means that evaluation is an iterative, flexible and dynamic

process. This way, the eHealth initiative is developed in several stages where the results of each evaluation provide input for the next development stage. Such a development process could ensure that a new eHealth initiative is actually used and effective.

Based on the research results and conclusion, and the framework for development of eHealth, several recommendations for a) further development and implementation of the QSC and b) further research are described in the last chapter of this research report. The eHealth development framework was developed, partly as a result of research performed by a PhD student at Medicinfo. Since this student will be employed by Medicinfo as a postdoc for the next two years, it is to be expected that Medicinfo will benefit from the implementation of this framework.

6. RECOMMENDATIONS

In this last chapter of the research report two types of recommendations are made. In paragraph 6.1 recommendations are made for further development of the QSC and implementation in primary care by Medicinfo. In paragraph 6.2 recommendations for further research are made.

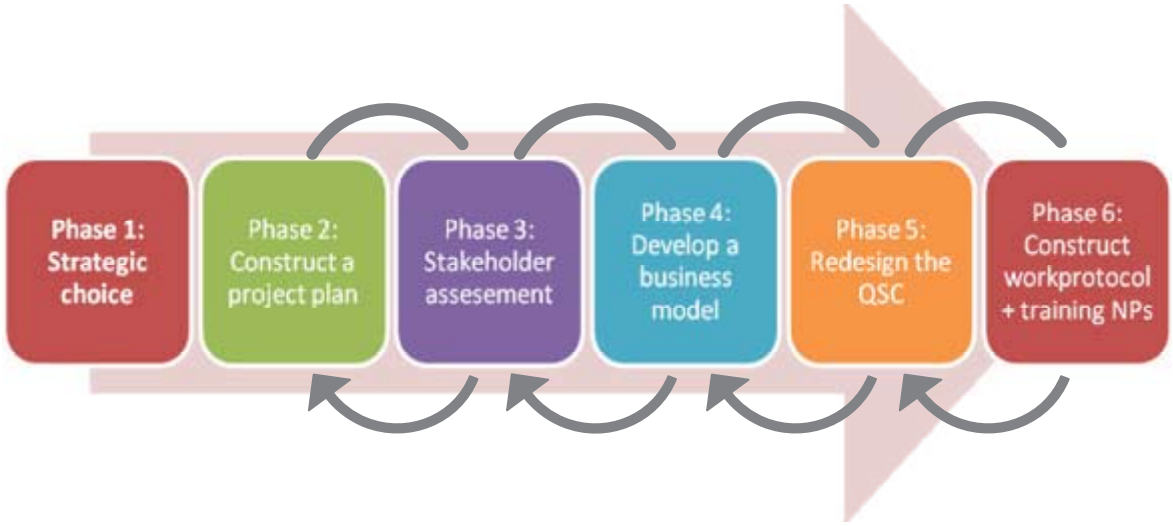
6.1 RECOMMENDATIONS FOR FURTHER DEVELOPMENT AND IMPLEMENTATION OF THE QSC

In the previous chapter, four main problems were identified that were caused by the expert driven development of the QSC: underuse and unintended use, insufficient tailoring, no integration of regular care and eHealth technology and an incomplete project plan. The eHealth development framework (Gemert-Pijnen, 2010) offers principles that can be used to find a solution to these problems and further develop and implement the QSC. These eHealth framework principles are:

- involvement of all stakeholders (the development of the QSC was technology driven which caused a number of problems, chapter 5)
- process of co-creation (target group, NPs and the insurance company were not involved in the development process of the QSC)
- and continuous evaluation (the QSC was only evaluated in this current study after implementation, there were no formative evaluations performed)

Based on these principles six phases can be identified, presented in figure 9. The six phases together form an integrated process. Before proceeding to the next phase, each phase needs an appropriate evaluation. All stakeholders are involved in this process from the start. The details of each phase are presented below figure 10.

Figure 10: Phases in further development and implementation of the QSC



Phase 1: Make a strategic choice about the QSC

Medicinfo needs to get a clear vision of the goals of the insurance company and the GP-team after the pilot. Will the QSC stay a b2b-product or do the insurance company and the GP-team want to improve the implementation of the QSC in primary care? If the outcome of this discussion is that the QSC needs to be further developed to be implemented in primary care, the next step is:

Phase 2: Construct a project plan

A solid project plan is needed as a guide for the rest of the development and evaluation process. The project plan should at least contain: a problem analysis, Medicinfo's goal statements (SMART), the involved stakeholders and details for each phase on planning, methods, budget and evaluation. This project plan can be adapted or completed further along the process if necessary.

Phase 3: Perform a stakeholder assessment

Put together a team representing target users (patients), NPs, the insurance company and Medicinfo (software developers). This team needs to think about how to integrate the QSC and the quit smoking consult in terms of self-management from a patients perspective. What do patients need, what is the role of the NP and what should the QSC be able to do? What are the critical success factors for implementation? Think about functionalities and goals and use this outcome to redesign the QSC on paper.

Phase 4: Develop a business model

Determine the kind of investments that are needed to further develop the QSC based on the stakeholder assessment. Furthermore, decide who the 'owner' of the QSC will be. Will it be the insurance company (more or less the current situation) or should the GP-team become the owner? This choice depends, amongst other factors, on the details of the COPD care path of the GP-team, the cost of the investments in the QSC and the goals of Medicinfo, the insurance company and the GP-team. After the choice of 'ownership' is made, agreements need to be made on selling price of the QSC, the exact value proposition, maintenance and the financing of the QSC as a part of the COPD care path.

Phase 5: Redesign the QSC

The Medicinfo should generate a mock up of the improved QSC based on the stakeholder assessment. This mock up needs to be tested by a group of end users. Have the improvements and adaptations made to the QSC lead to an e-coach that is user friendly, personalized and meets users' needs? With regard to usability: there should be easy pass words for the QSC for the first log in to the QSC. After that, the QSC should automatically ask

users to change their pass word. Assignments should be able to fill out on the computer, just like the intake questions. The assignment map button should be a red button and there needs to be a direct help button so NPs do not have to solve any technical problems.

Phase 6: Construct a work protocol and organize training for NPs

Invite the team of patients, NPs, the insurance company and Medicinfo to construct a work protocol. What should NPs do during the consults in relation to the QSC? How much time is needed to and allowed for spending on the QSC? Organize training for the NPs to work with the QSC. Reintroduce the improved QSC to all GPs and NPs of the Huisartsenteam. Show them the results of this evaluation study. Inform them about the work protocol and ask them to invest in follow up for evaluation purposes.

6.2 Recommendations for further research

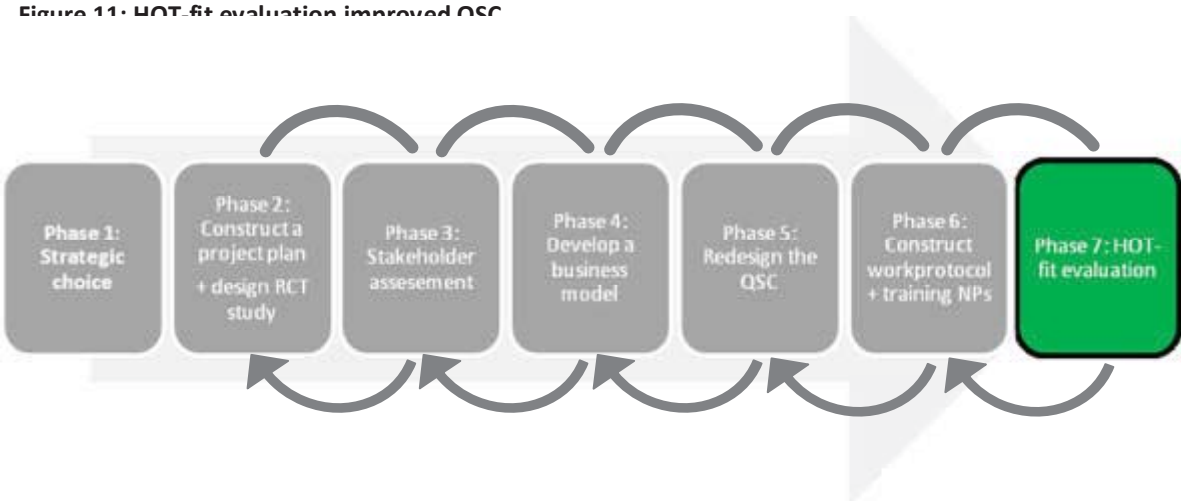
Next to recommendations for further development and implementation in the previous paragraph, also some recommendations for further research can be given. The first two recommendations have a connection with the development and implementation process of the QSC. The last recommendation is a suggestion for the development of eHealth more in general.

a) Evaluate the improved QSC

Evaluate the development process of improving the QSC and the implementation of it in primary care based on the eHealth framework. Does it meet the needs of all stakeholders? Have other barriers popped up that need to be addressed? Just like in the current study, the HOT-fit evaluation model can be used to design the research questions and approach. This evaluation study should be undertaken as an extra proces phase: summative evaluation,

phase 7. Figure 11 gives an overview of the process phases as suggested in the previous paragraph and the position of the evaluation of the improved QSC.

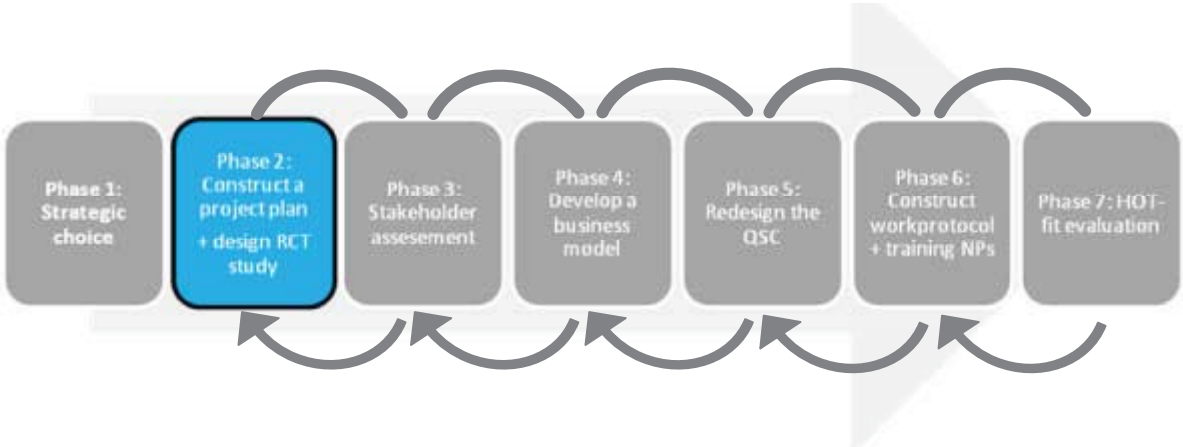
Figure 11: HOT-fit evaluation improved QSC



b) Measure the effectiveness

A question that has not been addressed in this study is “Is the QSC effective?”. A RCT study, comparing the integrated QSC in primary care to the regular quit smoking guidance by NPs, is needed to answer this question. This study should be designed early in the development process (phase 2, figure 12) as it takes time to prepare this research and find a sufficient number of enrollees for both quit smoking guidance programs.

Figure 12: RCT study design in phase 2



c) Perform research on personalization of e-coaching

For the development of eHealth in general it would be important perform further research on the personalization of e-coaches. Participants of the pilot project indica ted that the QSC was not very personalized. They expressed their wishes for personalization based on their individual experiences and events during the program. The technology of the QSC was not fit to perform this type of personalization. Further research is needed to understand why the way the QSC is personalized know does not work well. What kind of information do patients with an addiction to smoking (and in combination with a chronic disease like COPD) need from an e-coach to make it tailored to their specific needs? And what kind of ICT is needed to match these needs?

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APPENDIX

I. LIST OF TABLES

II. LIST OF FIGURES

II. OVERVIEW OF INTAKE QUESTIONS

Table 16: Intake questions QSC

INTAKE CATEGORY 1: WHAT KIND OF SMOKER ARE YOU?
a. What kind of tobacco (cigarettes/cigars/cigarillos/pipe/chewing tobacco) do you smoke?
b. How much cigarettes/cigars/cigarillos/pipe/chewing tobacco[7] do you smoke on average a day?
c. How much does a package cost on average?
d. How much cigarettes/cigars/cigarillos/pipe/chewing tobacco do you retrieve from one package?
e. How long after you've woken up do you smoke your first cigarettes/cigars/cigarillos/pipe/chewing tobacco?
f. Do you smoke more in the first hour after you've woken up than during the rest of the day?

[7] Referred in the report to as 'units of tobacco a day'.

g. Do you smoke when you're ill and spend most of your day in bed?
h. Do you find it hard not to smoke at place where this is prohibited (e.g. cinema, hospital, school, church)?
INTAKE CATEGORY 2: WHAT KIND OF QUITER ARE YOU?
a. How do you want to quit smoking?
b. Have you ever tried to quit smoking before?
c. Do you think you will use supportive methods, like chewing gum or medication, to quit smoking?
d. When (day-month-year) do you want to quit smoking?
INTAKE CATEGORY 3: A SUCCESSFUL ATTEMPT
a. Do you exercise?
b. Have you ever quit smoking for more than one week?
c. Do you have a medical advice to quit smoking?
d. Do you have young children?
e. Do you usually have a tranquil character?
f. Do you experience problems or stress at work at the moment?
g. Do you experience problems or stress at home at the moment?
h. Was it your own decision to quit smoking?
i. Do you think it is important to look good?
j. Do you want to improve your physical condition?
k. Do you want to improve your quality of life?
l. Do you want to stop your addiction to smoking?
m. Do you usually succeed when you carry out plans?
n. Do your family and good friend want you to quit smoking?
o. Is your body weight stable at the moment?
p. Is your mood stable at the moment?

III. INTERVIEW QUESTIONS

a) Participants

Introductie onderzoek

U doet mee aan een onderzoek naar de SMRC. Dit interview duurt ongeveer 1 uur. In deze tijd zal ik u een aantal vragen stellen en vragen een aantal taken op de computer uit voeren. Om goed te kunnen registreren welke antwoorden u geeft, zou ik graag een geluidsopname willen maken van dit interview. Gaat u hiermee akkoord? Naast deze geluidsopname schrijf ik ook mee met uw antwoorden. Daarnaast zullen uw bewegingen worden opgenomen via de webcam van de computer. Alle gegevens die verzameld worden in dit onderzoek worden vertrouwelijk behandeld en anoniem verwerkt. Dit betekent dat de antwoorden die u geeft tijdens dit interview in het verslag niet naar u terug te leiden zijn.

Opstarten computer en internet, openen website SMRC
De onderzoeker start de computer op, opent de website van de SMRC en zet de recorder van Morae aan. Onderzoeker schrijft mee met antwoorden.

Introductievragen
1. Hoe vaak gebruikt u het internet in het algemeen? Dagelijks, wekelijks of maandelijks?
2. Hoe vaak gebruikt u het internet voor informatie over uw gezondheid? Dagelijks, wekelijks, maandelijks?
3. Heeft de POH u uitleg gegeven over de SMRC? Zo ja, wat vond u hiervan?
4. Was het u voordat u de SMRC zelf had gebruikt wat u ermee kan doen?
5. Is het u op dit moment voldoende duidelijk wat u met de SMRC kan doen?
6. Vind u dat u voldoende uitleg hebt gekregen over de SMRC?
7. U hebt de SMRC aangeboden gekregen via uw praktijkondersteuner. Wat vind u daarvan?
8. Waarom heeft u zich opgegeven voor dit project?

9. Welk doel of welke doelen wil u bereiken met de SMRC?
10. Welke verwachting had u van de SMRC?
11. Waarvoor hebt u de SMRC zoal gebruikt?
12. Welke functie of welke functies van de SMRC vond u nuttig? Waarom? In hoeverre voldeden deze functies aan uw verwachting?
13. Welke functie of welke functies vond u niet nuttig? Waarom?
14. Is er iets dat u graag met de SMRC zou willen, maar wat met de huidige website niet kan?
15. Bent u tijdens het gebruik van de SMRC ook nog op consult geweest bij de POH? Waarom wel/niet?
16. Hebt u tijdens een consult met de POH uw gebruik van de SMRC besproken? Waarom wel/niet? Zo ja, wat hebt u besproken?
17. Wat vindt u van de combinatie van consulten bij de POH en uw eigen gebruik van de SMRC?
18. Heeft de SMRC u voldoende ondersteuning geboden bij het stoppen met roken? Waarom wel/niet?
19. Hebt u het gevoel dat de SMRC bij uw persoonlijke situatie aansluit? Waarom wel/niet?
20. Hebt u wel eens een terugval gehad, dat u weer begon met roken? Zo ja, hebt u toen de SMRC weer gebruikt? Waarom wel/niet? Is de SMRC voor deze situatie geschikt?
21. Verandert de SMRC de relatie met uw praktijkondersteuner? Waarom wel/niet? Zo ja, op welke manier?

Scenario's

Ik ga u nu vragen een aantal taken te doen met de SMRC. Het is hierbij van belang dat u de taken zo zelfstandig mogelijk uitvoert, net zoals u dat normaal ook zou doen. Ik zou u willen vragen om zoveel mogelijk hardop na te denken bij de uitvoering van elke taak.

1. U hebt van uw praktijkondersteuner over de SMRC gehoord. Voordat u gaat deelnemen aan de SMRC wilt u graag bekijken wat de SMRC kan en hoe het u kan ondersteunen, wat gaat u doen? Denk a.u.b. hardop na tijdens het uitvoeren van deze opdracht.
2. Stel, u hebt al een keer eerder geprobeerd te stoppen met roken. Hiervan bent u toen flink aangekomen. U wil graag weten of de SMRC u een advies kan geven zodat u deze keer op gewicht blijft. Wat gaat u doen? Denk a.u.b. hardop na tijdens het uitvoeren van deze opdracht.
3. U hebt een email ontvangen dat er een opdracht voor u klaar staat in de SMRC. U wil deze opdracht maken, hoe zou u dit aanpakken? Denk a.u.b. hardop na tijdens het uitvoeren van deze opdracht.
4. Aankomend weekend hebt u een feestje. U weet dat veel van de genodigden roken en u maakt zich zorgen dat u in de verleiding gebracht zult worden om ook een sigaret op te steken. U wil een vraag stellen via de SMRC om advies te krijgen over dit onderwerp, hoe zou u dit aanpakken? Denk a.u.b. hardop na tijdens het uitvoeren van deze opdracht.

Ik ga u nu weer een aantal vragen stellen.

1. Wat vindt u van de lettergrootte?
2. Wat vindt u van de afbeeldingen?
3. Wat vindt van de lay-out van de SMRC?
4. Wat vindt u van de gebruiksvriendelijkheid van de SMRC?
5. Hebt u wel eens problemen gehad tijdens het gebruik van de SMRC? Zo ja, welke?
6. Vond u het leuk om de SMRC te gebruiken? Waarom wel/niet?
7. Motivatiecheck:
    a. Wat vindt u van de motivatiecheck?
    b. Voldoet de motivatiecheck aan uw verwachting?
    c. Vindt u de motivatiecheck nuttig?
    d. Zou er voor u iets verbeterd moeten worden aan de motivatiecheck?
8. Intake:
    a. Wat vindt u van de intake?
    b. Voldoet de intake aan uw verwachting?
    c. Vindt u de intake nuttig?
    d. Zou er voor u iets verbeterd moeten worden aan de intake?
9. Opdrachten:
    a. Wat vindt u van de opdrachten?
    b. Voldoen de opdrachten aan uw verwachting?
    c. Vindt u de opdrachten nuttig?
    d. Zou er voor u iets verbeterd moeten worden aan de opdrachten?
10. Informatie:

a. Wat vindt u van de informatie in de SMRC?
b. Voldoet de informatie aan uw verwachting?
c. Vindt u de informatie nuttig?
d. Zou er voor u iets verbeterd moeten worden aan de informatie in de SMRC?

11. Tools:
    a. Wat vindt u van de tools?
    b. Voldoen de tools aan uw verwachting?
    c. Vindt u de tools nuttig?
    d. Zou er voor u iets verbeterd moeten worden aan de tools?
12. Emails:
    a. Wat vindt u van de emails?
    b. Voldoen de emails aan uw verwachting?
    c. Vindt u de emails nuttig?
    d. Zou er voor u iets verbeterd moeten worden aan de emails?
    e. Motiveerden de emails u om de website te bezoeken? Waarom wel/niet?
13. Zou u de SMRC in de toekomst blijven gebruiken? Waarom wel/niet?
14. Zou u anderen de SMRC aanraden? Waarom wel/niet?

b) Medicinfo

1. Wat zijn voor Medicinfo de doelen van de Stoppen met roken coach? Wat wil Medicinfo hiermee bereiken?
2. Waaraan moet de SMRC voldoen om deze doelen te kunnen bereiken? Is dit met de huidige coach het geval? Waarom wel/niet?
3. Op welke manier is de ontwikkeling van de SMRC gefinancierd? Is dit een open budget (is er ruimte om de SMRC continue door te ontwikkelen?)
4. Is er binnen dit budget ook ruimte voor onderhoud aan de SMRC (content updates, technische problemen, etc). Vervult Medicinfo die taken op dit moment, wat dan?
5. Waarom is de MIS de basis geweest voor de SMRC? Wat is hier het voordeel van?
6. Wie is de gebruiker van de SMRC? Leeftijd, opleidingsniveau, ervaren/onervaren internetgebruiker, zware/lichte roker, etc. Waarom dit type gebruiker?
7. Wat is de rol van Medicinfo in het dagelijks gebruik van de SMRC? Wie is verantwoordelijk voor welke taken?
8. De SMRC is een website ter ondersteuning bij SMRC. Waarin onderscheidt de SMRC zich van andere websites over stoppen met roken?
9. Beschrijf hoe de SMRC geïntroduceerd is aan de POH's.
10. De POH heeft een sleutelrol bij het gebruik van de SMRC, namelijk het aanbieden ervan aan patiënten. Wat verwacht Medicinfo van deze rol van de POH in relatie tot de SMRC? Beschrijf taken.
11. Op welke manier verdient Medicinfo geld aan de SMRC? Krijgt Medicinfo een vergoeding per gebruiker? Hoeveel gebruikers moeten er dan minimaal zijn om de gemaakte kosten terug te verdienen? Welke afspraken zijn hierover gemaakt en met wie?
12. Uit interviews met patiënten en POH's is gebleken dat zij een aantal wensen hebben ten aanzien van de SMRC, namelijk:

- Contact met 'lotgenoten', via bijvoorbeeld een forum of een community omgeving met chatfunctie *(wat betekent dit voor de rol van Medicinfo bij het dagelijkse gebruik van de SMRC? Zijn er barrières? Zo ja, welke? Wat betekent dit voor de doelen van Medicinfo met de SMRC?)*
- Feedback van een zorgprofessional, via bijvoorbeeld mailcontact met de POH via de SMRC *(wat betekent dit voor de rol van Medicinfo bij het dagelijkse gebruik van de SMRC? Zijn er barrières? Zo ja, welke? Wat betekent dit voor de doelen van Medicinfo met de SMRC?)*
- Monitoring van behaalde resultaten/voortgang, via bijvoorbeeld grafieken over het aantal gerookte sigaretten, stemming en gevoelens, maar ook via een dagboekfunctie en het online opslaan opdrachten *(wat betekent dit voor de rol van Medicinfo bij het dagelijkse gebruik van de SMRC? Zijn er barrières? Zo ja, welke? Wat betekent dit voor de doelen van Medicinfo met de SMRC?)*
- Persoonlijkere benadering, via herinneringsmailtjes die gelinkt zijn aan dagboekgegevens of andere vormen van zelfmonitoring via de SMRC *(wat betekent dit voor de rol van Medicinfo bij het dagelijkse gebruik van de SMRC? Zijn er barrières? Zo ja, welke? Wat betekent dit voor de doelen van Medicinfo met de SMRC?)*

13. Wat gaat Medicinfo doen als straks blijkt dat de website flinke aanpassingen nodig heeft willen de doelen gerealiseerd kunnen worden? Is er dan meer geld/investering nodig van de zorgverzekeraar, zijn hierover al afspraken gemaakt? Wat moet medicinfo hiervoor doen?

c) Zorgverzekeraar

1. Medicinfo heeft een SMRC ontwikkeld. Waarom doet de zorgverzekeraar mee aan dit project?
2. Wat zijn voor de zorgverzekeraar de doelen van de Stoppen met roken coach? Wat wil de zorgverzekeraar hiermee bereiken?
3. Waaraan moet de SMRC voldoen om deze doelen te kunnen bereiken? Is dit met de huidige coach het geval? Waarom wel/niet?
4. De SMRC is een website ter ondersteuning bij SMRC. Waarin onderscheidt de SMRC zich van andere websites over stoppen met roken?
5. De POH heeft een sleutelrol bij het gebruik van de SMRC, namelijk het aanbieden ervan aan patiënten. Wat verwacht de zorgverzekeraar van deze rol van de POH in relatie tot de SMRC?
6. Wanneer is de SMRC door de zorgverzekeraar te beschouwen als een succes?
7. Wat gaat de zorgverzekeraar doen als straks blijkt dat de website flinke aanpassingen nodig heeft willen de doelen gerealiseerd kunnen worden? Is er dan meer geld/investering nodig van de zorgverzekeraar, zijn hierover al afspraken gemaakt?

d) NPs

1. Waarom doet u mee aan dit project?
2. Gebruikt u de MIS voor uw consulten? Waarom wel/niet?
3. Hoe staat u over het gebruik van ICT in de zorg in het algemeen?
4. Kunt u beschrijven hoe de SMRC aan u geïntroduceerd werd? Wat vond u van deze introductie?
5. Was het u na de introductie duidelijk wat er van u verwacht werd bij dit project? Waarom wel/niet?
6. Kunt u beschrijven wat u denkt dat er van u verwacht werd? Sluit dit aan bij uw behoeften? Zou er iets verbeterd kunnen worden aan de introductie?
7. Hoe gemotiveerd was u om de SMRC te gebruiken?
8. Bespreekt u uw ervaringen met de SMRC wel eens met collega's? Wat bespreekt u dan ongeveer?
9. Wat was uw verwachting van de SMRC? Wat hoopt u ermee te bereiken?
10. Hebt u zelf wel eens de SMRC bekeken? Waarom wel/niet?
11. Kunt u een voordeel en een nadeel noemen van de SMRC?
12. In hoeverre komen de SMRC en de MIS in uw optiek overeen? Is dit belangrijk? Waarom wel/niet?
13. Vindt u het nuttig dat de stappen van de MIS de basis zijn voor de SMRC? Waarom wel/niet?
14. Voor welke patiënten is de SMRC geschikt? Voor welke patiënten niet?
15. Hoe bepaalt u aan wie u de SMRC aanbiedt?
16. Hebt u het aanbieden van de SMRC geïntegreerd in het consult? Waarom wel/niet?
17. Zo ja, kunt u omschrijven hoe u het aanbieden van de SMRC hebt geïntegreerd in het SMR consult?
18. Wat vertelt u patiënten over de SMRC?
19. Hoeveel tijd bent u kwijt aan het aanbieden van de SMRC tijdens een consult?
20. Met hoeveel patiënten spreekt u af voor een vervolg stoppen met roken consult (hetzij in de praktijk of telefonisch) wanneer zij ook de SMRC gebruiken? (alle patiënten, bijna alle patiënten, bijna geen enkele patiënt, geen enkele patiënt) Waarom?
21. Indien POH vervolgconsulten afspreekt: komt het gebruik van de SMRC ter sprake tijdens dit consult? Op welke manier, wie neemt hiertoe het initiatief?
22. Probeert u op de hoogte te blijven van de vorderingen en ervaringen van de patiënt met de SMRC? Waarom wel/niet? Zo ja, op welke manier doet u dat? Voldoet dit aan uw behoefte?

23. De functies in de SMRC zijn vrijwel allemaal gericht op de patiënt, ofwel de SMRC biedt eigenlijk geen mogelijkheden voor de POH om de SMRC te gebruiken, wat vindt u hiervan? Voldoet dit aan uw verwachtingen en behoeften? Waarom wel/niet?
24. Zo niet, wat zou u ermee willen doen?
25. Hoe zou u dit gebruik van de SMRC willen integreren in de dagelijkse praktijk? Hebt u hier tijd voor?
26. Patiënten geven aan dat ze graag feedback van u zouden willen hebben op de resultaten van opdrachten, wat vindt u hiervan? Is dat mogelijk in de dagelijkse praktijk?