MASTER THESIS

Evaluating a smoking cessation app by involving end-users and health insurance companies: a mixed method approach.

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Abstract

Background mHealth has seen an increase in use in the past years. However, most mHealth applications are not widely implemented. The problem is two-fold: most mHealth evaluations only focus on effective outcomes and not on usability, as well as limited focus on financial incentives for potential investor stakeholders. The smoking cessation application Stopmaatje has been released in 2018 to the public and has not been met with wide implementation. Both user experience and stakeholder involvement have to be evaluated for positive implementation. A mixed-methods approach was used to gain insights into the user experience and the requirements for eHealth set by health insurance companies.

Methods This thesis consisted of two studies: user experience and a stakeholder analysis. The user experience part consisted of a log data analysis, usage pattern analysis, and a questionnaire. Log data of 1336 participants were collected within the Stopmaatje application and 12 responses were gathered on the questionnaire. Descriptive analyses were used on the log data and questionnaire responses. The stakeholder analysis consisted of three semi-structured interviews with four participants. A qualitative analysis was done on the interviews based on the NASSS framework. Five codes were gathered. Data triangulation was executed to combine the results of both studies.

Results The log data (n = 1336) showed that more than half of the users did not return to Stopmaatje after two sessions. Only 6.3% of the users were deemed as adherent. Adherent users mostly returned to the app to monitor their progress on their current cessation attempt. User experience scores on the questionnaire (n = 12) were overall positive. Respondents showed a positive behavioral intention to continue using the app, but this was not reflected in the log data analysis. The stakeholder analysis (n = 4) resulted in five themes: the condition, the technology, the value proposition, the organization, and the wider system. Health insurance companies showed interest in telemonitoring applications, reduction in current healthcare costs, and were more likely to implement eHealth if it had been endorsed by their overarching association.

Conclusion Significant attrition was found, but no clear reasons for this attrition were found in the questionnaire. While there is a positive behavioral intention, this has not been translated into actual behavior yet. This points to an intention-behavior gap. Usage patterns can be used to support the uptake of Stopmaatje. The stakeholder analysis revealed different factors of interest for health insurance companies in eHealth. However, applications like Stopmaatje are not their top priority. Stopmaatje can create an interesting business case by adding efficiency to current smoking cessation treatments.

Contents

List of Figures

List of Tables

1 Introduction

Approximately 22,9% of the Dutch adult population smokes. This unhealthy habit is a 2,4 billion a year expense for the Dutch healthcare system (Volksgezondheid en Zorg, 2018). Consequences of smoking are, i.e., lung damage, heart disease, risks of several types of cancers, and other chronic diseases (Bottorff et al., 2016). Fortunately, the trend of adult smoking is decreasing every year, which means that more people try to quit, and even more do not start smoking. Around two-thirds of the total smoker population admitted to a desire to quit (Karim, AlHarbi, AlKadhi, & AlOthaim, 2017). Unfortunately, most of these quit attempts prove to be unsuccessful. With the help of counseling, these cessation attempts can become effective (Buller, Borland, Bettinghaus, Shane, & Zimmerman, 2014). However, smoking cessation programs are still underutilized due to limited scalability and reach (Karim et al., 2017).

In 2001, Eysenbach (2001) introduced the term 'eHealth'. eHealth, later on, was defined as "the use of emerging interactive technologies to enable health improvement and health care services" (Ahern, Kreslake, & Phalen, 2006). eHealth focuses on digitalizing healthcare and focusing on the patient perspective. eHealth has the potential to transform the delivery of healthcare, as it makes healthcare more accessible and less costly for a large user base (McClure, Hartzler, & Catz, 2016). It comes as no surprise that eHealth applications have already been developed for many causes, including smoking cessation (Maramis, Mylonopoulou, Stibe, Isomursu, & Chouvarda, 2019). However, in most development cycles there is little attention for implementation, while this should be a central part of the development cycle (Pieterse, Kip, & Cruz-Martínez, 2019). This the common issue of eHealth interventions fail to be fully embedded or scaled up in the real world (Ossebaard & Van Gemert-Pijnen, 2016; Majeed-Ariss et al., 2015).

1.1 mHealth evaluation

eHealth interventions focused on smartphone applications are defined as mHealth. Mobile phone ownership is nearly universal, and interventions can be delivered in real-time to the user. Some of the positive traits of mHealth are cost-efficiency, personalization, accessibility, anonymity, possibilities for time-sensitive messages, and more (Trimbos-instituut & Nederlandse Huisartsen Genootshap, 2016; Müssener, Linderoth, Thomas, & Bendtsen, 2020).

These traits have caused a rise in designed mHealth interventions. Most of these interventions were designed from the perspective of healthcare, and not the stakeholders' (Ghorai, Akter, Khatun, & Ray, 2014). However, mHealth requires a more multidisciplinary method of work. It is a common trend for mHealth interventions to overlook user needs and contextual factors, as well as a lack of market research (Peiris, Jaime Miranda, & Mohr, 2018; Bhattacharya, Kumar, Kaushal, & Singh, 2018). Without a design strategy that addresses the challenges of mHealth, these applications can become difficult to implement (Ben-Zeev et al., 2015). This explains why the majority of released mHealth interventions struggle in practice.

Most of the released mHealth interventions are evidence-based (Abroms, Lee Westmaas, Bontemps-Jones, Ramani, & Mellerson, 2013). Strong points of the apps are the specific targeting of smokers and interactivity, which can increase quit rates. However, only a small part of the inventory included research on user engagement. In addition to this, end user perspectives and experiences have yet to be published in most cases (Struik, Bottorff, Baskerville, Oliffe, & Crichton, 2019; Danaher, Brendryen, Seeley, Tyler, & Woolley, 2015). The importance of user-involved testing is seen in several studies: improvements in task completion, navigation on websites, but also providing insights into which features are preferred by users (Buller et al., 2014; Stoddard, Augustson, & Mabry, 2006). In short, most studies focus on the effectiveness of applications, rather than content and user experience.

The lack of including stakeholders into the design process could explain the high dropout rates seen in smoking cessation applications (Van Gemert-Pijnen, Kelders, & Bohlmeijer, 2014; Arden-Close et al., 2015; Goldenhersch et al., 2020). Studies that have involved the target group in the design process gather more in-depth information on guidelines to design for higher adoption rates (Bock, Heron, Jennings, Magee, & Morrow, 2013; Hartzler, BlueSpruce, Catz, & McClure, 2016; Stoddard et al., 2006). Not only user insight is seen as a key point for implementation, but also aligning mHealth initiatives with key stakeholders plays a big part in successful implementation. Securing financial aid, as well as assessing the willingness of healthcare providers to adopt the initiative is seen as highly important (Franz-Vasdeki, Pratt, Newsome, & Germann, 2015; Jindal et al., 2019). This makes both user experience research and stakeholder analyses important aspects to the implementation of smoking cessation applications.

1.2 Stopmaatje, a smoking cessation application

In 2015, a cooperation of Hogeschool Saxion, Tactus Verslavingszorg, MST Twente, and the University of Twente started a project to aid smoking cessation in the Dutch population. Stopmaatje is a smoking cessation application that helps people through the stressful times of quitting their smoking habits. Both user experience and stakeholder perspectives were focus points during the design phase. However, after the launch, no further research has been dedicated to either user experience or stakeholder perspectives concerning the implementation of Stopmaatje. Below, an explanation is given that highlights the factors of focus and upon which this thesis will focus.

The content of Stopmaatje is based on Intervention Mapping (Bartholomew et al., 2006) and the CeHRes Roadmap (van Gemert-Pijnen, Kelders, Kip, & Sanderman, 2018). Intervention Mapping was used to make an extensive problem analysis. A needs assessment and goal analysis are the building blocks of the behavioral outcomes the intervention should reach (Bartholomew et al., 2006). The CeHRes Roadmap helped translate these behavioral outcomes into the technological aspects of Stopmaatje. The roadmap has been designed for eHealth specifically and provides guidelines on how to implement behavior change techniques in technology (van Gemert-Pijnen et al., 2018).

Michie, Hyder, Walia, and West (2011) defined three important classifications concerning behavior change techniques (BCTs) for smoking cessation: addressing motivation, improving self-regulatory capacity, and promoting adjuvant activities. Motivation is reinforced through information provision, reinforcement, and reminders. Seeing the large levels of dropout in mHealth users, motivation is one of the key points of focus in Stopmaatje's design (Arden-Close et al., 2015; Goldenhersch et al., 2020). The second set of BCTs deal with improving self-regulatory capacities. Ex-smokers have a need to maximize their skills and capacity of self-control in order to avoid tempting situations (West, 2009). For this sake goal setting, cue recognition, and self-monitoring have been introduced into the design. Lastly, adjuvant activities involve seeking distraction and social support. A more in-depth look into the working elements of Stopmaatje is given in Table 1 (see Methods chapter).

Stakeholders were actively involved in the design process: nurses, smokers, Tactus employees, and health insurance companies employees. Focus groups were held to determine the most important functions, technical boundaries, and traits of the overall user group. With this, the design of Stopmaatje aimed to build an implementation infrastructure. The further implementation of Stopmaatje concerns two activities: user experience and stakeholder analysis. The first part of this thesis will focus on assessing the user experience of Stopmaatje. The second part of this thesis will focus on the involvement of Stopmaatje's stakeholders. In order to successfully analyze both aspects of Stopmaatje, a mixed-method approach will be taken. The goal of this thesis is to present an advice on the redesign of Stopmaatje which is aimed at improving the user experience, as well as chances on structural implementation.

To create more understanding for the type of research done in this thesis, the following sections will elaborate on user experience research and stakeholder analysis research with a focus on smoking cessation applications.

1.3 User experience research

A critical aspect of mHealth is user experience (Vilardaga et al., 2018). User experience (UX) is a popular concept within the HCI (Human-Computer Interaction) field. The term still lacks a clear definition (Bernhaupt & Pirker, 2013). The definition of user experience for this thesis is provided by the International Organization for Standardization as: 'perceptions, feelings, and responses by an individual towards the actual or anticipated use of a product, system, or service' (ISO 9241, 1999). Designing a usable system can lead to benefits like increased productivity, reduced errors, improved acceptance, and enhanced reputation. This goes for most software (Maguire, 2001). However, in our case, the software is designed to stimulate behavior change within health-related conditions (Vilardaga et al., 2016).

For this study, the user experience will be measured through two different methods: log data analysis and a user experience questionnaire.

Log data analysis Log data analysis provides a look into the behavioral reactions of a user towards an app. Often, upon looking at what causes certain adherence levels or levels of effectiveness, researchers focus on the characteristics of their users, while the actual characteristics of the digital intervention are overlooked. Log data analysis is frequently used to understand which elements of the intervention work towards greater adherence or effectiveness (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012).

Important information gathered from log files deals with how users walk through the intervention. How often they log in, what actions they perform while logged in, and the amount of time spent logged in; these are all variables that play a role when determining adherence and later on effectiveness (Donkin et al., 2013). However, a study by Donkin et al. (2011) shows that the effect of adherence on outcomes is only positively associated when certain modules of the intervention were completed. Research on usage patterns can provide insights in what functions of an intervention are used and whether users return to these functions. This information on how persuasive functions work is valuable to increase adherence by increasing usability as well as the persuasiveness of the system (Han, 2011; Kelders & van Gemert-Pijnen, 2013; Van Gemert-Pijnen et al., 2014). It is therefore important to take the results of log data analysis into account when redesigning mHealth for better outcomes.

For this thesis, the focus will be on adherence and usage patterns. The goal of the log data analysis will be to understand how Stopmaatje's users interact with the app, using the number of logins, number of actions per session, and amount of time spent per session as predictors. Log data provides insight into the actual and objective behavior of the user (Sieverink, Kelders, Poel, & van Gemert-Pijnen, 2017). This form of analysis helps define adherence and usage patterns to an intervention but does not define the effects of these factors. In most cases log data analysis is used to gain insight into the effects of a certain intervention, by looking at which features were used (Moller et al., 2017). Thus, log data analysis is an essential part of the evaluation of Stopmaatje.

User experience models User experience research explores the user's interaction with the product and their feelings towards the product, with a focus on affective, meaningful, and valuable aspects of the usage (Vermeeren et al., 2010). However, the measurements of UX seem to be divided into two camps. In the first place, UX is translated into qualitative data, whereas additionally, the reductionist way is to translate UX into quantitative data. Using a mixed-methods approach, in order to benefit from both measures, has therefore been recommended (Law, 2011).

The goal of Stopmaatje's UX evaluation is to see whether the service provides positive experiences for the users and which features of the system provide such experiences. To delve deeper into the theory of UX, Hassenzahl's model of UX from a user's perspective is used, as displayed in Figure 1. The original model consists of five key elements, but for this thesis, it was chosen to focus on two. These two important elements are pragmatic and hedonic attributes. Pragmatic features cover the usability and utility of the product ('do-goals'), while hedonic features cover more personal aspects of the product, like personal growth, self-expression, and the product's ability to provoke

user memories ('be-goals') (Hassenzahl, 2008). Both hedonic and pragmatic qualities have been used to assess user interfaces, in which pragmatic qualities serve utility and hedonic qualities serve stimulation (Taylor & Hassenzahl, 2009).

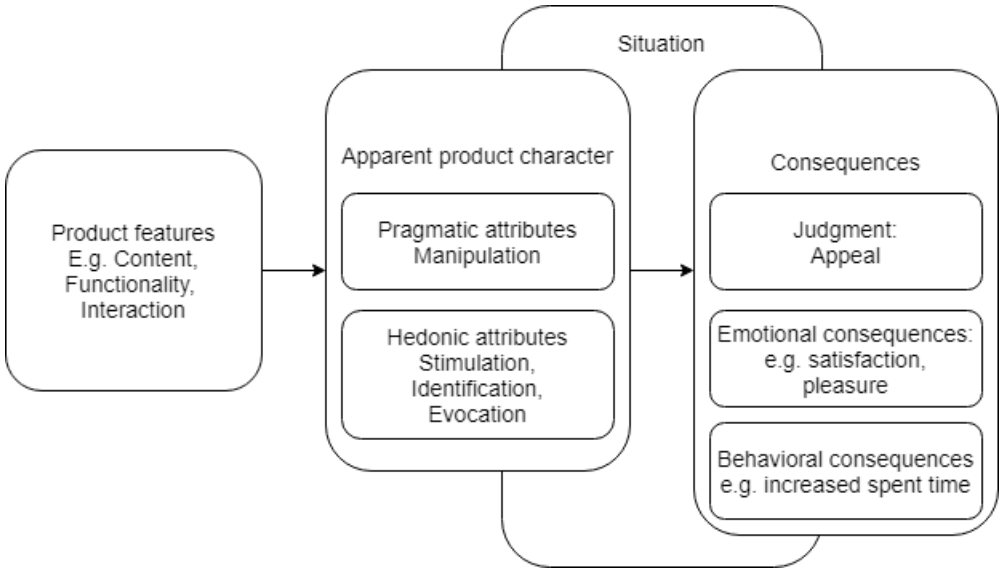

Figure 1. UX Model From User Perspective By Hassenzahl.

Hedonic and pragmatic attributes influence the judgment of a product. The user will experience emotional and behavioral consequences, like satisfaction and pleasure (Väätäjä, Koponen, & Roto, 2009). Based on this model, research can focus on the pragmatic and hedonic attributes of Stopmaatje and look into what consequences these attributes follow up with. Where pragmatic quality focuses on utility and usability, hedonic qualities go beyond the product and visualize personal needs. Both factors contribute to the perceived overall value of the product (Hassenzahl, Platz, Burmester, & Lehner, 2000; Hassenzahl, Schöbel, & Trautmann, 2008). The Hassenzahl model has been used to identify facilitators and barriers in a blended treatment, which were used to further the development (Siemer et al., 2020).

Another model of interest when evaluating Stopmaatje is the Unified Theory of Acceptance and Use of Technology Model (UTAUT) by Venkatesh (See Figure 2) (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT describes the acceptance of an information system with the help of four core variables: performance expectancy, effort expectancy, social influence, and facilitating conditions. The four moderating variables are age, gender, experience, and voluntariness of use (Im, Hong, & Kang, 2011).

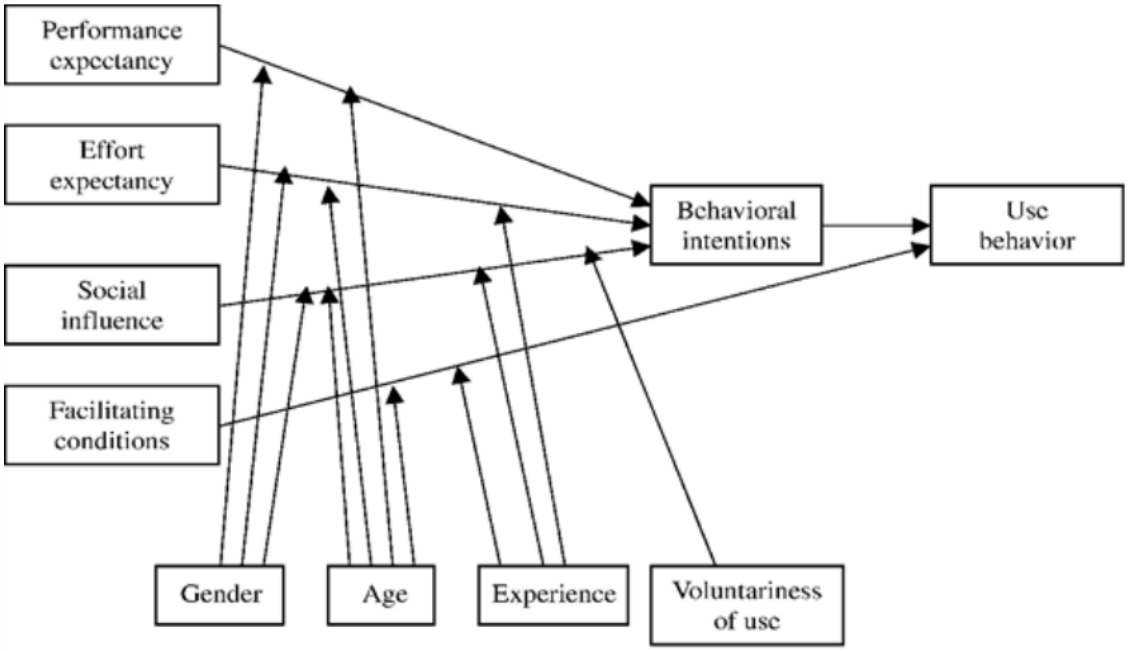

Figure 2. Unified Theory of Acceptance and Use of Technology Model by Venkatesh.

A study on smoking cessation application has shown that the elements of UTAUT do positively influence behavioral intention. This would suggest that the UTAUT model could explain smokers' acceptance and intended use of the application (Ghorai & Ray, 2019). It should be noted, however, that a positive behavioral intention does not have to be translated into actual usage. This 'intention-behavior' gap shows that intentions do not always affect behavior in the way the model predicts (Bhattacherjee & Sanford, 2009).

Core variables from both models will be used for Stopmaatje's evaluation. Hassenzahl's model concerns itself more with attitudinal, aesthetic, and emotional factors of Stopmaatje, but would lack in-depth factors concerning usability. The UTAUT model focuses on predicting the behavioral intention to use Stopmaatje (Etinger & Orehovački, 2017; Hassenzahl, 2008). Both models complement each other in these areas.

The design of an mHealth application should focus on developing a pleasant and useful experience for its users, so they experience the service positively (Triberti & Brivio, 2020). Designing for a user-focused system will keep users engaged in the service, while ineffective systems can have detrimental effects on adherence (Choi & Tulu, 2017). Thus, it is important to investigate what kind of experiences users undergo when using Stopmaatje.

For this thesis, both Hassenzahl's and Venkatesh's models will be used to look into the perceived user experience of Stopmaatje. The creation of the user experience survey will include aspects of both models.

1.4 Stakeholder analysis

The involvement of stakeholders in the design and implementation process is a crucial aspect of the success of Stopmaatje. The goal of this part of the thesis is to present a key stakeholder's evaluation of mHealth in their organization, preferably aimed at smoking cessation.

For Stopmaatje's implementation to be successful, the needs and wishes of stakeholders were translated into the design of the product (Ammenwerth & Rigby, 2016). During the design phase of Stopmaatje, the following potential key stakeholders have been identified: health care providers, clients (end-users), employers, IT management, and healthcare insurers. Following the stakeholder salience model of Mitchell, Agle, and Wood (1997) the following map has been made in Figure 3. This model includes three factors: urgency, legitimacy, and power. Urgency entails the degree to which a stakeholder claims for immediate action. Legitimacy entails the assumption that the actions of a stakeholder are seen as desirable. Power entails the power one social actor can have over the other (Erdiaw-Kwasie, Alam, & Shahiduzzaman, 2017).

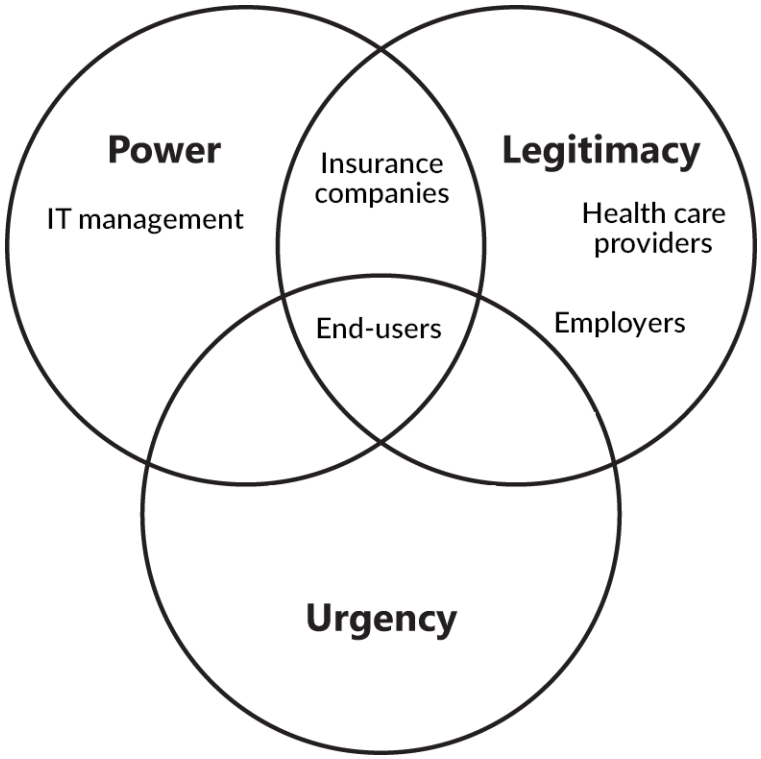

Figure 3. Stakeholder Salience Map.

As can be seen in Figure 3, the end-user group influences all three factors and is thereby a primary stakeholder. They are the ones in need of the intervention (urgency), can determine certain aspects of the intervention (power), and execute actions that are desirable for the cause (legitimacy). An example of a powerful stakeholder is the IT

management that can determine how certain things are translated into Stopmaatje. They determine how the intervention looks like. Legitimate stakeholders are both the health care providers and the employers. They will play a minor role in the intervention, mostly acting as referrers. Health insurance companies are both seen as powerful and legitimate as they can make certain demands before deciding to fund the intervention, as well as distributing the intervention amongst their clients.

The end users have been involved consistently during the entire design process, making them a primary stakeholder. The user experience study in this thesis focuses on their evaluation and how Stopmaatje can be improved. For implementation and possible financial aid, health insurance companies were included as a second stakeholder. Health insurance companies have both influences in the fields of power and legitimacy, seeing as they can choose to invest and therefore make demands on how the intervention works.

In the Netherlands, eHealth has received a lot of attention over the past few years. The acceleration of the implementation of eHealth is, therefore, a top priority. Health insurance companies are one element of that puzzle. In most cases, health insurance companies finance the use of eHealth by their clients by the use of clauses in their contracts. This way, health insurance companies can see whether eHealth applications work in practice. Therefore, they are a key point in the national implementation of eHealth practices (Nederlandse Zorgautoriteit, 2018).

Health insurance companies have certain interests within the implementation of an eHealth program. The following points of interests have been found (Van Velthoven & Cordon, 2019; van Limburg & van Gemert-Pijnen, 2011; Bally & Cesuroglu, 2020; Janssen, Hettinga, Visser, et al., 2013).

- Increased sense of efficiency; decreasing current healthcare costs and delivering high-quality care within existing budgets
- The innovation must fit within the current healthcare system
- The possibility to substitute or support current treatments
- A possibility to implement the innovation nationwide

An eHealth application, like Stopmaatje, will only become insured care when it provides proof of effectiveness and it does not affect the structure of the current care (Couwenbergh, 2011; Nederlandse Zorgautoriteit, 2018). Currently, little is known about eHealth interest specifically aimed at smoking cessation within Dutch health insurance companies.

While health insurance companies have shown interest in implementing eHealth, the current guidelines for financial support are not clear. This causes discouragement in eHealth adoption and impedes the national implementation (Janssen, Hettinga, Prins, et al., 2013). This calls for a more in-depth analysis of health insurance companies and what they see as value in eHealth. As Stopmaatje is only available in Dutch, the focus will be on Dutch health insurance companies.

In order to investigate whether and how Stopmaatje can fit into the demands of the health insurance companies, interviews will be held. One model of interest is the Nonadoption Abandonment and challenges to the Scale-up, Spread, and Sustainability of health and care technologies (NASSS) framework by Greenhalgh et al. (2018). In most cases, eHealth initiatives are either not adopted or fail to scale up. This can be seen in the current state of Stopmaatje. While it has been out since 2018, uptake has shown to be low. The NASSS framework will highlight the complexity of Stopmaatje and reduce it wherever possible. Greenhalgh (2018) claims that these complexity issues are one of the reasons why eHealth fails in healthcare.

The NASSS framework includes 7 domains: the condition, the technology, the value proposition, the adopters, the organization, the wider system, and the embedding and adaptation over time. The framework aims to illustrate challenges across each domain. Studies have shown that NASSS assists in identifying the uncertainties and interdependencies that need to be managed for the intervention to succeed (Dyb, Berntsen, & Kvam, 2021; Abimbola et al., 2019; Greenhalgh et al., 2018). In this study, the NASSS framework is used to explore the possible barriers and facilitators for Stopmaatje based on the perspectives of health insurance companies.

1.5 Mixed methods as a bridge between two domains

These two studies combined make for a mixed-methods approach. In a general sense, a mixed-methods approach uses both qualitative and quantitative methods to strengthen the results of a study (Schoonenboom & Johnson, 2017), (McKim, 2017).

The use of mixed methods in user experience is not uncommon. Most studies combine some form of usability testing (quantitative data) with semi-structured interviews (qualitative data). The quantitative data provides information on adherence, usability, and user experience, while the qualitative data acts as additional information on found results in the quantitative data set (Argent et al., 2019; Kim et al., 2020; Nelson, Mulvaney, Johnson, & Osborn, 2017). However, most user experience studies like these focus on the user base as their only stakeholder. In this thesis, another stakeholder group has been taken into account, namely, health insurance companies.

Implementation should be seen as a multi-level process (Ross, Stevenson, Lau, & Murray, 2016). Only when user perspectives, the context in which eHealth is used, content, and actual usage of the program are taken into account, this will result in a realistic image of the implementation process (Proctor et al., 2009; Damschroder et al., 2009; Pieterse et al., 2019). In order to get to these results, not only different types of data are needed, but also from different aspects of eHealth implementation (Kip, Sieverink, van Gemert-Pijnen, Bouman, & Kelders, 2020). Data triangulation is used to integrate data from these different aspects.

In this thesis, a mixed-methods approach will be applied to the implementation outcomes and or process of Stopmaatje. The study will focus on both users and health insurance companies. As mentioned previously, different stakeholder groups may not always have aligning goals. Using a mixed-methods approach, this thesis will try to

find differences and similarities between these two stakeholders. This is interesting for Stopmaatje's implementation plan because it provides insight into not only the usability perspectives of the users of Stopmaatje but also the interests of an important financial stakeholder.

1.6 Research questions

The aim of this thesis is two-fold. Firstly, the aim will be to evaluate Stopmaatje with a focus on user experience. Due to the limited availability of literature in the field of user experience combined with stakeholder analysis, a more exploratory method of research will be used. Secondly, the aim will be to analyze the needs and wishes of health insurers in the field of mHealth investment. The end-product of this evaluation will lead to a list of improvements for both the design of the app and of its implementation strategies. These improvements aim to provide the developers of Stopmaatje with a better overview of the current interests of its stakeholders. This will be done by using a mixed-methods approach.

The research questions have been divided into three areas: the user experience study, the stakeholder analysis, and the triangulation of both studies.

1.6.1 Research questions from user experience

1. How is Stopmaatje experienced by the users?
    (a) How is Stopmaatje used by its userbase?
    (b) What is the difference in usage patterns between low, moderate, adherent users of Stopmaatje?
    (c) What is the user experience score of Stopmaatje based on the elements of the Hassenzahl and UTAUT models?

1.6.2 Research questions from stakeholder analysis

1. To what extent does Stopmaatje fulfill the requirements of eHealth/mHealth implementation set by health insurance companies?
    (a) What are barriers for Stopmaatje in these current regulations?
    (b) What are facilitators for Stopmaatje in these current regulations?

1.6.3 Research questions from data triangulation

1. What kind of improvements are needed so that Stopmaatje becomes a more attractive option for both users and health insurance companies?
    (a) What are the complementary elements that come forward in both the user experience and stakeholder analysis?

(b) What are the opposing elements that come forward in both the user experience and stakeholder analysis?

2 Methods

To answer the research question, two studies were conducted: a quantitative log data analysis combined with a questionnaire and a qualitative stakeholder analysis. Figure 4 depicts the taken approach. The qualitative study consisted of three smaller studies: a log data analysis, a usage pattern analysis, and a questionnaire. The following sections will delve further into the approach taken. The quantitative study was approved by the Ethics Committee BMS at the University of Twente under the record number 201174.

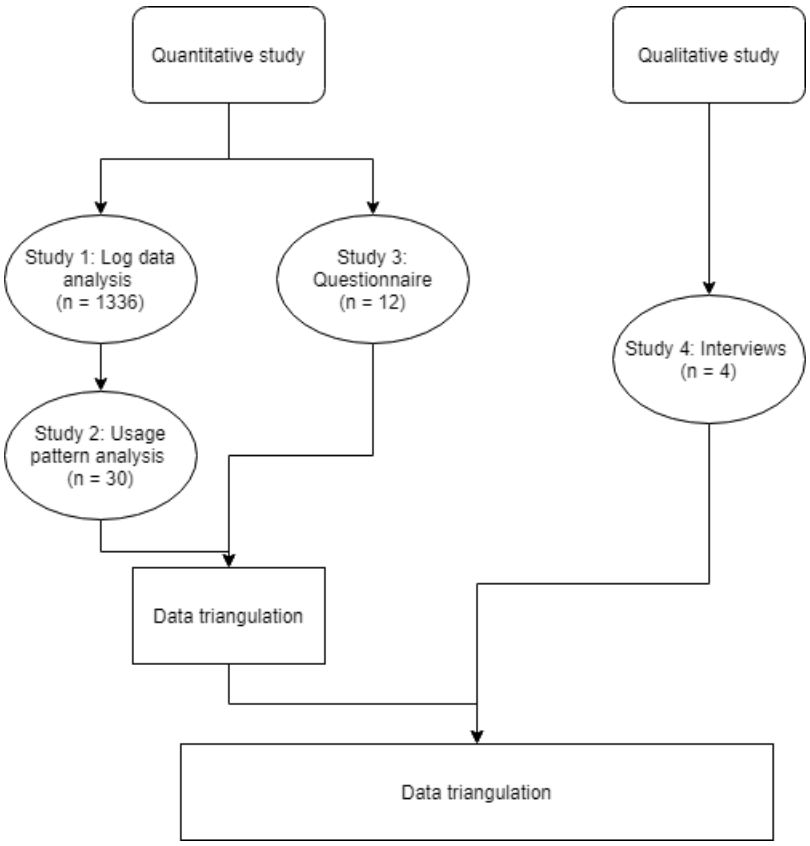

Figure 4. Design Of The Study, Following A Concurrent Mixed Methods Design.

2.1 User experience

The user experience study consisted of two samples: users of Stopmaatje active between September 2020 and December 2020 and questionnaire respondents. Log data analysis was performed on the first sample and questionnaire results were analyzed for the second sample. A subsample (n = 30) was taken from the log data to analyze usage patterns.

2.1.1 Participants

The log data study involved 1336 participants. Their demographics were unknown. Inclusion criteria were that the participants agreed to the terms and conditions of the app and that they logged in between September 1st, 2020, and December 31st, 2020. The log data files included all entries between September 1st, 2020, and December 31st, 2020.

The user experience study involved 12 participants. This sample involved 8 women and 4 men, the mean age was 44 (SD 11). Inclusion criteria for the study were that all participants were over the age of 18, had a smartphone and working internet connection, wanted to quit within two weeks before and two weeks after the start of the study. The sampling method used to gather participants was via personal connections, e.g. friends and family, work, and the quit smoking clinic at the MST. Participants signed an informed consent form and completed a questionnaire concerning their demographics (age, gender, educational level), smoke, and quitting behavior. This questionnaire served as the collection of baseline data of the participant pool. All of the participants were Dutch.

2.1.2 Procedure

Usage data of Stopmaatje was gathered through the log files of the app (n = 1336). All data were handled according to the current GDPR.

Recruitment for the questionnaire occurred between September 2020 and February 2021. Recruitment took place through e-mail and flyers distributed in doctor's offices and personal connections. During the recruitment stage, 23 participants were contacted initially through e-mail. Of these, one participant could not participate due to not owning a smartphone. Participants were informed through e-mail about the purpose of this study. In this e-mail, participants were instructed to download the app and use it for as long as they liked. Afterward, they were sent a questionnaire concerning the user experience, including informed consent and demographic section. The data of 10 participants could not be taken into analysis due to them either not having filled in the questionnaire or not having completed the questionnaire. In the end, the data of 13 participants were used for analysis.

2.1.3 Materials

Stopmaatje When users log in to Stopmaatje, they are navigated to the home page. From this home page, users can access a number of features. These features can be defined as general features and content features. General features include the profile (where users can edit their personal information such as their name and email address) and settings (where users can edit their preference for push notifications). Content features serve the purpose of providing users with help during their current cessation attempt. These are the functions that are based on BCTs (Michie et al., 2011). Table 1 gives a brief overview of the features of Stopmaatje and their corresponding BCTs.

Table 1

Functions Of Stopmaatje And Their Corresponding BCTs.

Feature	Description	Acting BCT
Game	Users can access a whack-a-mole-based game whenever they seek distraction.	Distraction
Facts	Users can find information on the benefits of smoking cessation, downsides of smoking.	Information provision on health consequences, information provision on general consequences
Goals	Users can set goals that they want to accomplish. An overview of current and accomplished goals is provided on this screen as well. Goals are money-based.	Goal-setting, review of goals
Tips	Users receive short, general text prompts that provide information on how to continue their current cessation attempt.	Goal setting, advice on changing routine
Chat	Users can find other users of Stopmaatje and initiate a conversation through text messaging.	Social support
Help	Whenever users feel like their cessation attempt might fail, they can reach out for help. This is either given through contact with another user, a professional, or through 'mini-interventions'.	Cue recognition, distraction, social support
Diary	In this function users can register difficult moments in their cessation attempt. If users have handled this moment correctly, they can write down how they did it. If not, they can write down what went wrong.	Cue recognition, self-monitoring, self-efficacy
Monitor	This function allows users to see their statistics on usage of the app and their current attempt (e.g. how many days since the quit date, how much money they have saved, etc.).	Self-monitoring, rewards on process, feedback on behavior, feedback on outcomes of behavior

Log data To collect data on the usage patterns of the participants (n = 1336), log data was generated in an Excel sheet. The log data displayed anonymous information on the actions taken by all users. The following information was displayed within the log data: 1) an anonymous user identifier (user-id), 2) an identification of the action, 3) additional information of the action, and 4) the time and date of the action. Action

types that were logged were login, log out, monitor, game, goals, profile, facts, diary, chat, settings, tips, and panic. Additional information on the actions included, for example, which tip in the 'tips' menu was opened. All data were stored following the current privacy regulations. Log data used for this study was collected from 1 September 2020 0:00 to 31 December 2020 23:59.

Questionnaire construction The questionnaire was constructed to gain insight into the demographics, UTAUT user experience (Van Der Vaart, Atema, & Evers, 2016), and Hassenzahl user experience (Väätäjä et al., 2009).

The demographic questionnaire was based on the 'Meetinstrument voor onderzoek naar roken en stoppen met roken' materials by STIVORO (Mudde, Willemsen, Kremers, & De Vries, 2006). It consisted of 12 items including questions about, age, gender, educational level, mHealth literacy, smoking behavior, and quitting behavior.

The User Experience questionnaire was based on two UX scales. The first scale was based on aspects of the UTAUT model. The scale included 20 items, which focus on four factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. Items were taken and translated from Van Der Vaart et al. (2016). In this same study, all five subscales showed significant correlations, and that the UTAUT model explained 59% of behavioral intention to use an online self-management intervention. All subscales were measured with 16 items formulated as statements (see Table 2). Participants were able to answer these items on a 5-point Likert scale, ranging from 'Totally disagree' to 'Totally agree'. An overview of the subscales and their corresponding items can be found in Appendix A.

Table 2

Subscales, Number Of Items, And Example Items Of The Used UTAUT Questionnaire.

Subscale	Number of items	Example item
Performance expectancy	6	I think it is useful to use Stopmaatje when quitting smoking.
Effort expectancy	5	I think Stopmaatje is difficult to use.
Social influence	4	My usage of Stopmaatje is experienced as something positive by my family and friends.
Facilitating conditions	4	I think Stopmaatje is too advanced for me in terms of technology.

The second scale used was based on the Hassenzahl model. The scale included 14 items focusing on two factors: pragmatic and hedonic qualities. Items were taken and

translated from a questionnaire designed by Väätäjä et al. (2009). The questionnaire itself is currently only tested within the field of a mobile journalism system. Subscales were measured by using a 5-point bipolar scale, asking participants to rate Stopmaatje according to the two statements mentioned, see Table 3 for the details. An overview of the subscales and their corresponding items can be found in Appendix A.

Table 3

Subscales, Number Of Items, And Example Items Of The Used Hassenzahl Questionnaire.

Subscale	Number of items	Example items
Pragmatic qualities	8	Difficult design vs Easy design Logical design vs Inconsistent design
Hedonic qualities	6	Frustrating use vs Enthusiastic use Trustworthy design vs Untrustworthy design

2.1.4 Data analysis

Log data All log data was provided in an Excel sheet. JavaScript was used to organize the given log data into usable tables.

First, for every user (n = 1336), the number of log-in sessions was recorded. A log-in session was defined by counting the number of log-in actions within every unique user id. Next, the number of actions taken within a session was counted alongside the average duration of each session. A session was seen as terminated whenever a user had not performed an action within the last 30 minutes of their last action (Sieverink, Kelders, Braakman-Jansen, & Van Gemert-Pijnen, 2014; Kelders, T. Bohlmeijer, & Van Gemert-Pijnen, 2013).

A division was made between non-adherers, moderate adherers, and adherers to the intervention. Due to Stopmaatje having no clear adherence guidelines, the cut-off between the three groups was chosen arbitrarily. All users with less than or 5 sessions were seen as non-adherers, users with more than 5 and less than 15 sessions were seen as moderate adherers, and users with more than 15 sessions were seen as adherers. Of these three groups, 10 randomly chosen users were analyzed for their use patterns. Users were chosen at random. The division was made to explore whether there were differences between these three user groups. Of these users (n = 30), all sessions were analyzed for session duration over time, the time between sessions, and feature usage over time. The choice for this small subsample was made because usage patterns were analyzed by hand due to limited available software.

User experience Analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics 27). Items from the questionnaire were recoded in such a way that all items were either posed positively (UTAUT) or ordered from negative to positive (Hassenzahl). Items 4, 7, 9, 10, 16, 17, and 19 had to be recoded for the UTAUT questionnaire, and items 2, 3, 6, 7, 9, 12, and 14 for the Hassenzahl questionnaire. Due to the low number of responses, internal consistency reliability measures could not be calculated for this questionnaire. For reliability scores, refer to Van Der Vaart et al. (2016) and Väätäjä et al. (2009) for their designed instruments.

Mean scores for the items were calculated by using the arithmetic means. Based on these mean scores, all participants received a score for every scale. Scores of the participants were compared to each other and their demographics to see if any of these variables could be in correlation with either a low or a high user experience. This was done in accordance with the moderating variables of both the UTAUT and Hassenzahl models (Venkatesh et al., 2003; Hassenzahl, 2008). Due to the low number of responses, analyses will be of a more qualitative nature by using visual inspection instead of statistic measures.

Triangulation Using both the results of the log data analysis as well as the results of the user experience questionnaire, conclusions were drawn on the design of Stopmaatje. The log data analysis was used to visualize user behavior, which was translated into feature usage and session times. These results were meant as a basis for which features were used often and thus which BCTs were more active in user behavior. In turn, usage patterns served to define the differences between high and low adherers and to look into user-specific use. The questionnaire results were used to analyze why users performed their behavior and what the cognitive rating of Stopmaatje was. Descriptive analysis was done to find similar factors in both the log data analysis as well as the user experience questionnaire. Such factors focus on why the user base might be low or high adherent, based on both feature usage as well as the user experience components in the questionnaire. The analysis was done based on the mean score per user experience factor, findings from the usage patterns, and feature usage. It is descriptive due to the low number of responses.

2.2 Stakeholder analysis

2.2.1 Participants

In the study, four participants took part. Of these four participants, two represented two separate health insurance companies, and two represented an overarching association concerned with health insurance companies. Sampling took place through a personal network and convenience sampling. Before the interviews took place and were recorded, participants gave permission to use all data gathered for this study. Inclusion criteria were that all participants were employed in a health insurance company and were involved in the implementation of eHealth within that health insurance company. For

this study, employees from two health insurance companies were interviewed, as well as two employees from the overarching association.

2.2.2 Procedure

Semi-structured interviews were held with one or two participants per session in the online environment of Microsoft Teams. Interviews took 45 to 60 minutes. Informed consent was obtained at the time of the interview. The main topics discussed during the interview were: prevention policies, eHealth as part of the care system, and eHealth implementation by the health insurance company. Due to the semi-structured nature of the interviews, follow-up questions could be posed during the discussion of the main topics. After the main topics were discussed, the interview was concluded and the participants were thanked for their participation. All interviews were electronically recorded and transcribed afterward. All identifiers of names were removed from the transcriptions.

2.2.3 Materials

An interview guide was developed consisting of 18 open-ended questions based on the interview guide developed by Kadesjö Banck and Bernhardsson (2020). The guide mostly focuses on the processes of eHealth decisions within a health insurance company and how these companies value the field of eHealth. In short, the following topics will be covered: 1) the condition, 2) the technology, 3) the value proposition, 4) the wider system, and 5) embedding and adaptation over time. These topics are based on the domains of the NASSS framework and represent domains 1, 2, 3, 6, and 7 (Greenhalgh et al., 2018). The full interview guide can be found in Appendix B. The interviews were semi-structured. All questions in the interview guide were leading questions for the interview, but additional questions for details were also probed during the conversation. When enough information was gathered on one domain, the interviewer would continue on to the next domain.

2.2.4 Data analysis

The interviews were analyzed using a coding system for analyzing qualitative data using ATLAS.ti software. Content analysis was used to gather core themes within the interviews and to compare different interviews. First, each transcript was read through multiple times to gain an understanding of core themes within the answers. Subsequently, the NASSS domains served as an analytical framework and helped assign codes to meaningful units within the transcripts. The five domains in which codes were assigned were: 1) the condition, 2) the technology, 3) the value proposition, 4) the organization, and 5) the wider system. Two domains were left out of the analysis: the adopters and implementation and adaptation over time. This was due to health insurance companies being a mediator between the actual adopters of eHealth, so they are not heavily involved in the actual physical process of implementation. For the

definitions of the domains, see Appendix C. A single researcher (SB) performed the coding, therefore no inter-coder reliability was calculated.

2.3 Data triangulation

For this mixed-methods approach, triangulation was chosen as the most suitable analysis technique. The goal of triangulation was to seek convergence between the two studies. This convergence would either be seen in complementary or opposing elements (Bishop, 2015). By using a concurrent design, both studies were undertaken simultaneously. For the data analysis, this meant that key findings from both studies were compared to each other. Keeping in mind that two different stakeholders were involved in this process, these complementary or opposing elements would not be as clear. The analyses were done qualitatively.

3 Results

3.1 User experience

3.1.1 Log data analysis (n = 1336)

Overall usage The average number of sessions per user was 5.17 (SD = 8.59, n = 1336, M = 3), with the minimum amount of sessions being one and the maximum being 90. Figure 5 depicts the distribution. After the first two sessions, 48.5% of the users (650/1336) did not return.

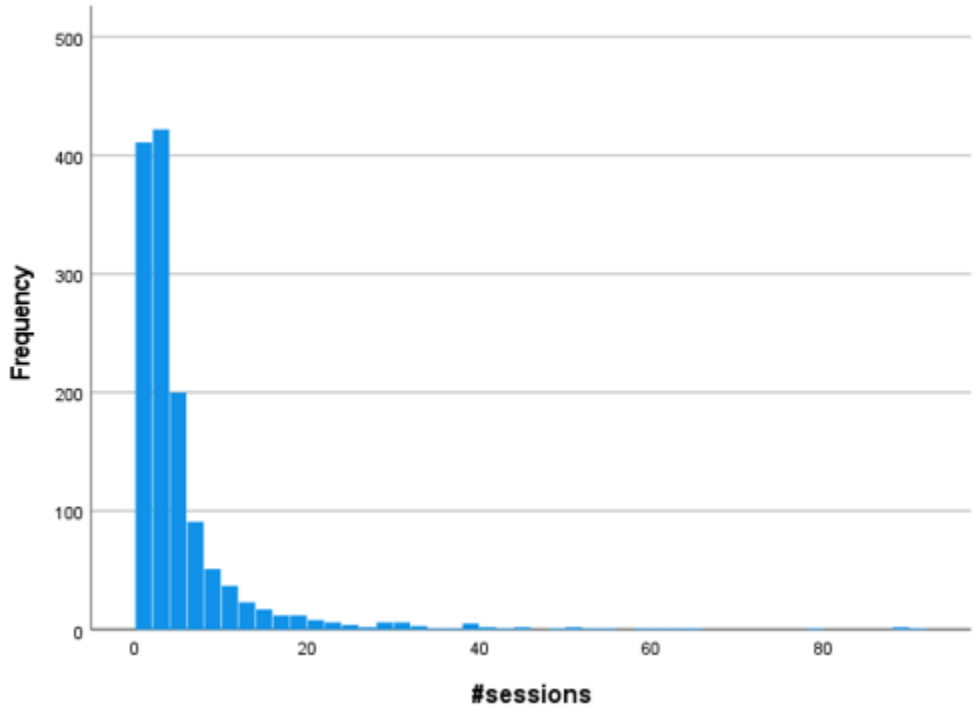

Figure 5. The Number Of Sessions Distributed For All Participants (n = 1336).

Overall, the monitor service was used the most (18.1% of all actions taken by users), followed by respectively the help service (14.1%) and the game service (12.6%) respectively. The lowest used features were the tips service (5.0%), the diary service (7.2%), and the facts service (7.9%). Table 4 encloses the frequencies of all the services accompanied by their percentages. The overall mean number of actions within a session was 9.06 (SD = 8.60, n = 1336, M = 6,82), with a minimum of 2 and a maximum of 130.5. Figure 6 shows the distribution of the mean number of actions within a session. Figure 7 shows the distribution of the number of sessions per user against the mean number of actions taken within one session. It should be noted that users with a lower number of sessions are often the ones with a higher number of actions within a session. One outlier was removed.

Table 4

Frequencies Of Services Used By Users (n = 1336).

Service used	Frequency	%
Monitor	4697	18.1
Help	3657	14.1
Game	3269	12.6
Chat	3200	12.4
Profile	2989	11.5
Goals	2891	11.2
Facts	2044	7.9
Diary	1858	7.2
Tips	1299	5.0

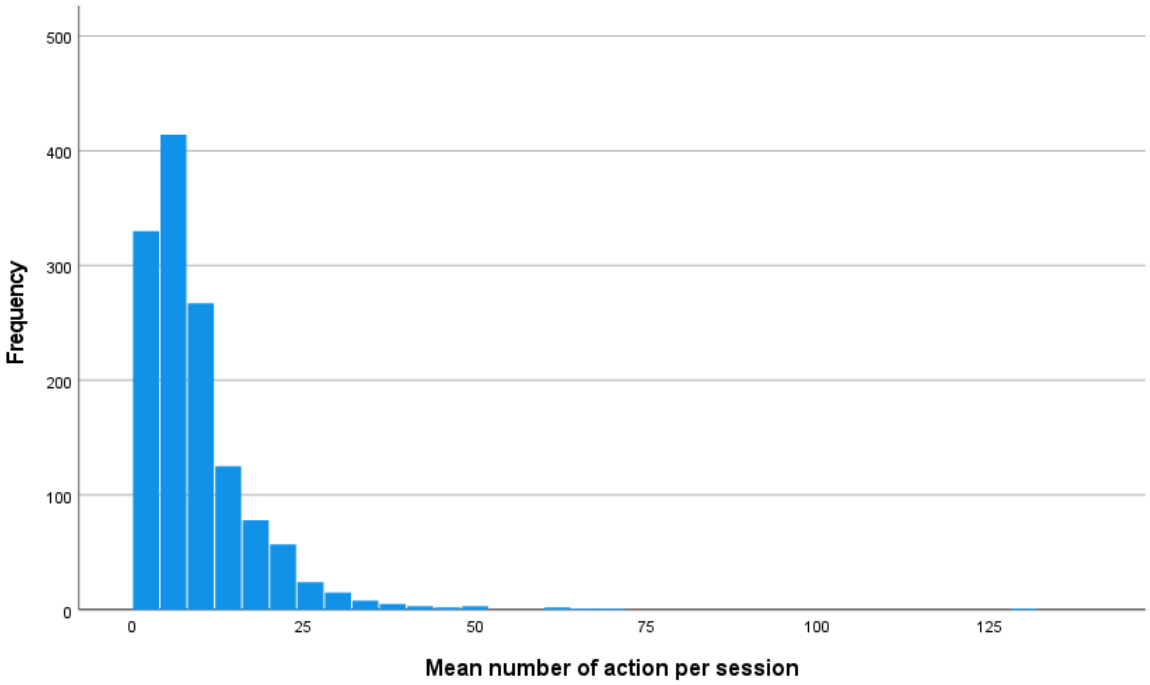

Figure 6. The Mean Number Of Actions Taken Within One Session (n = 1336).

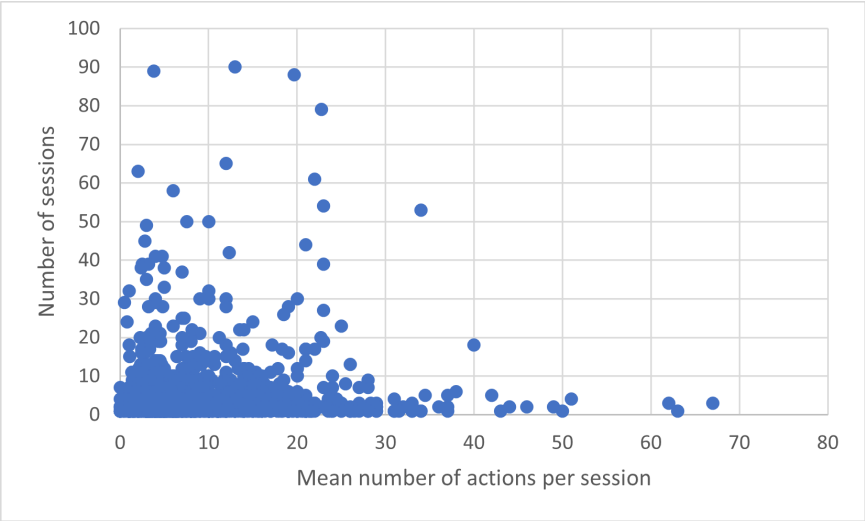

Figure 7. The Number Of Sessions Against Mean Number Of Actions Taken Within One Session (n = 1336).

The average session duration differed highly among users. The mean session duration was calculated to be 130.88 seconds (SD = 152.11, n = 1335, M = 84), with a minimum of 0 seconds and a maximum of 1527 seconds. Again, the same skewness can be observed as in Figure 5 and Figure 6. Results are displayed in Figure 8. For the intervals between sessions, all users with just one session were filtered out. The mean interval time between sessions is 56.57 hours (SD = 58.99, n = 963, M = 22,22). Figure 9 shows that most users with a higher number of sessions are more likely to have smaller intervals between their sessions. Users with low session numbers either have too few session intervals to draw a conclusion or show long session intervals, hinting at non-adherence.

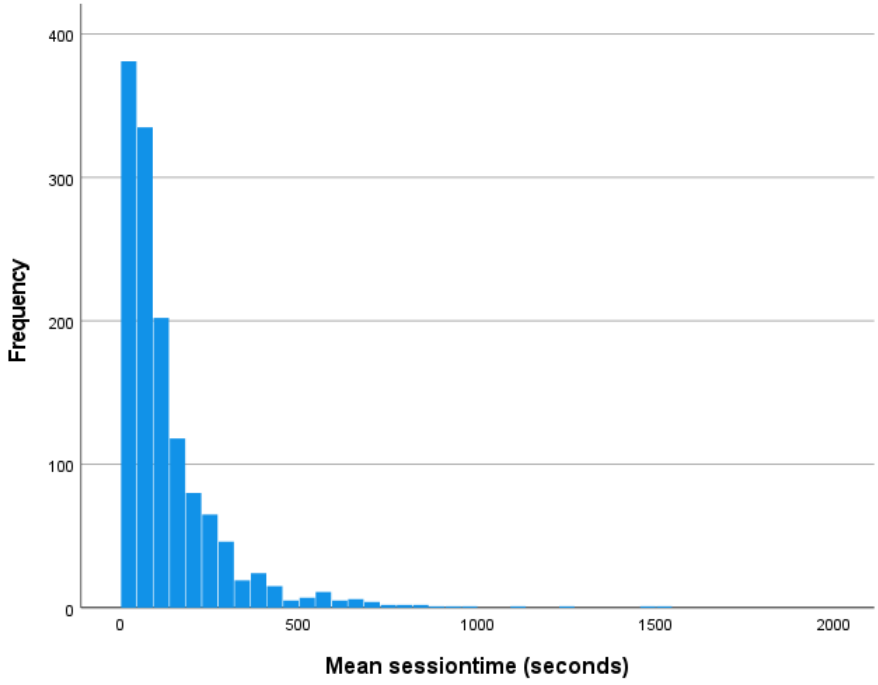

Figure 8. Mean Session Duration Of Stopmaatje Users In Seconds (n = 1335).

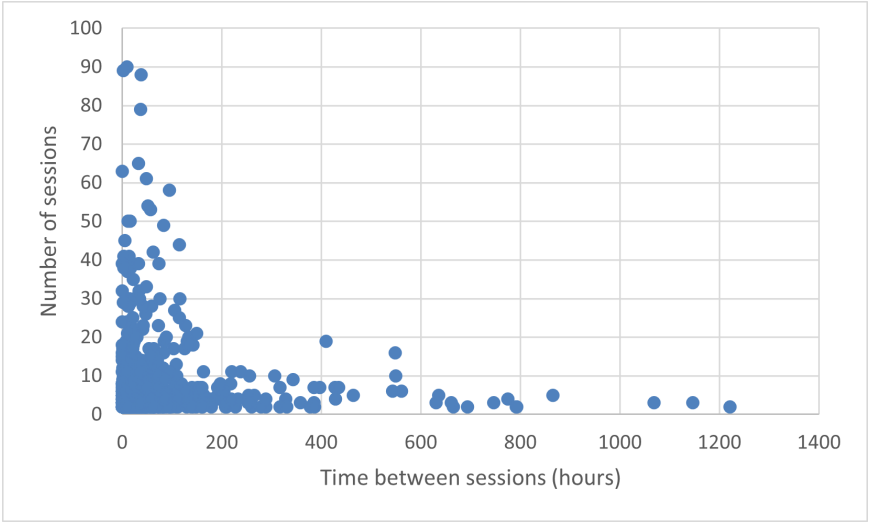

Figure 9. Mean Amount Of Time Between Sessions In Hours (n = 963).

Use Pattern analysis (n = 30) The log data shows that 77.4% (1034/1336) is non-adherent (had less than 5 sessions), 16.3% (218/1336) is moderate adherent (had between 5 and 15 sessions), and 6.3% (84/1336) is high adherent. Per group, 10 randomly chosen user ids were chosen for further analysis. A summary of the log data

information is shown in Table 5. In this table, it can be seen that there are differences in the usage of Stopmaatje between the three user groups. First, it is notable that adherers use fewer features per session than both moderate- and non-adherers. Second, adherers spend less time per session in the app than other user groups. Finally, moderate adherers differed greatly in their time between sessions.

Table 5

Summary Of User Groups With n = 30.

Variable	Non adherers (SD)	Moderate adherers (SD)	Adherers (SD)
Total sessions	2.17 (0.97)	7.93 (1.11)	32.80 (9.93)
Features used per session	2.52 (1.20)	2.81 (1.97)	1.34 (0.90)
Total duration of session (sec)	110.87 (84.64)	157.15 (193.71)	59.55 (91.80)
Time in between sessions (hours)	44.96 (41.61))	72.89 (86.26)	36.46 (37.01)

When looking at the feature usage of the three groups, the following notable patterns were observed:

- Adherers often come back to the app to use 1 to 3 specific features
- The monitor feature seems to be a popular feature for users in both the moderate adherer and adherer groups
- In both the moderate adherer and adherer groups there are a lot of sessions that include just a log-in action
- Non-adherers 'use' multiple different features and do not develop any recognizable pattern
- First sessions are often the longest, causing a big difference between session times in the different user groups.

3.1.2 Results user experience questionnaire (n = 12)

Table 6 shows a summary of the demographics of the participants' pool. The mean age of the participants is 44 (*SD* 11). The majority of the participants had an education level of WO (42%) followed closely by HBO (33%). Of the participants, 11 out of 12 were current smokers, of which 9 did on a daily basis. All participants but 1 had done a previous quitting attempt before. Of those, 10 had done an attempt lasting for 3 months or more, with the longest (and current) attempt being 11 years. 5 out of 11 quitters had not used any resources for their attempts. For the people that had used

Table 6

Demographics Of The Participants.

Demographic information	Responses n = 12 (%)
Gender	
Female	8 (67)
Male	4 (33)
Age category	
18-30	3 (25)
31-40	0 (0)
41-50	5 (42)
>51	4 (33)
Education level	
MBO	2 (17)
MAVO	1 (8)
HBO	4 (33)
WO	5 (42)
Daily consumed products	
Currently smoking	11 (92)
<10 cigarettes	3 (27)
10-19 cigarettes	4 (37)
20-29 cigarettes	3 (27)
>30 cigarettes	1 (9)

resources to quit, nicotine-replacing products and medications were a popular choice of help.

Of the 12 participants, just 1 (8%) had previous experiences with using digital cessation support. Most participants were either neutral (50%) or hesitant (33%) to use digital measures for their quitting attempts and would not describe themselves as someone who experiments with new technologies (58%).

A summary of the results per user per measured factor can be seen in Table 8. Results depict the mean of items per measured factor of one individual. A note on this summary is that user 5 did not complete the Hassenzahl part of the questionnaire, but his results for the UTAUT part were used for the analysis. More detailed information on the results per question is depicted in Appendix D. Positive responses were seen in questions 7, 16, and 18 ("I think Stopmaatje is easy to use", "I don't think Stopmaatje is technologically advanced", and "I am glad that Stopmaatje is free").

Table 7

Summary Of The UX Questionnaire Results Per User.

User no	UTAUT				Hassenzahl	
	PE	EE	SI	FC	Pragmatic	Hedonic
1	3.8	2.6	3.3	3.8	2.8	3.2
2	2.0	2.8	2.8	3.0	2.4	3.0
3	3.5	4.2	3.8	3.8	3.7	3.4
4	3.3	4.0	3.3	3.8	3.3	4.0
5	3.5	3.6	3.5	3.5	-	-
6	1.2	3.2	2.0	2.8	3.2	2.0
7	4.0	3.6	3.5	3.8	4.1	3.8
8	3.2	3.4	2.5	3.8	3.7	3.8
9	4.0	3.8	4.0	4.3	3.9	4.0
10	3.5	3.2	3.3	3.8	3.6	3.6
11	4.0	4.0	4.0	4.3	4.4	4.0
12	4.0	4.0	3.5	4.3	3.9	4.0
Average	3.3	3.5	3.3	3.7	3.6	3.5

[a] With PE = performance expectancy, EE = effort expectancy, SI = social influence, and FC = facilitating conditions [b] Particpant 5 did not complete the questionnaire, so their results have not been included in both the pragmatic and hedonic factors. [c] Items were measured on a 1-5 Likert scale. Ranging from 1 = totally disagree, to 5 = totally agree.

When calculating the mean scores per participant per factor, participants 11, 9, and 12 were found to score the highest on the four UTAUT scales. The lowest scoring users were 2, 6, and 1. Of these three users, only user 9 expressed interest in using (new) technologies, the other two considered themselves to be rather apprehensive. Comparing these two users with the three lowest scoring users on the UTAUT scales, they were equally apprehensive. Users with a higher level of education were seen to be more negative in their questionnaire responses. Especially the factor of Facilitating Conditions shows high scores among all users.

It is interesting to see that users 1, 2, and 6 also score low on the Hassenzahl questionnaire. Users 1 and 2 score low on the pragmatic scale especially, while 6 does so on the hedonic scale. A similar result can also be seen within users 11, 9, and 12, who previously scored highest on the UTAUT scales and also do so on the Hassenzahl scales. There seems to be a relation between the results of the two surveys.

The last three questions of the survey asked the users if they would continue using the app if they would undergo a new quitting attempt and whether they would recommend the app to friends and/or colleagues. Users 2, 6, and 10 indicated that they would not on all three questions. While users 2 and 6 both scored low on UTAUT and Hassenzahl, user 10 scored fairly high on all factors of the two models. Users 1, 3, 7, 9, and 11 were fairly positive on these last three questions. Aside from user 1, all these users had high scores on one of the models.

Users indicating a positive answer on whether they would want to continue using the app scored especially high on the four factors of the UTAUT model and the two of Hassenzahl (users 7, 9, and 11), with an exception of user 12, who did not want to continue using Stopmaatje. The same pattern can be seen in users scoring low on both models, they would not want to continue using Stopmaatje (users 2 and 6). Most users with scores in between showed positive behavioral intention to continue using Stopmaatje. Users scoring low on Social Influences were less inclined to share Stopmaatje with friends or colleagues (users 2, 6, and 8).

3.2 Stakeholder Analysis

Coding was performed to find possible barriers and facilitators for the implementation of Stopmaatje for health insurance companies. From the three interviews, five codes were derived: the condition, the technology, the value proposition, the organization, and the wider system. Using these codes, a summary of implementation techniques can be determined. The coding scheme in Appendix C gives an overview of the code frequencies in the interviews. The codes are provided in order of the NASSS framework (Greenhalgh et al., 2018). The interviews were held with four participants, two represented health insurance companies and two represented an overarching association (referenced as OA).

The condition Health insurance companies (HICs) have been working on creating prevention policies in recent years. Interviewees mentioned that prevention policies work either by preventing certain treatments from happening (e.g. cancer treatment when considering smoking) or shorten treatments. One interviewee mentioned that prevention policies might not be seen as an attractive business case (when looking at it strictly from a financial perspective), but that most insurance companies are focusing on increasing the quality of life for their clients. This can be seen in the interviews, seeing as both HICs stressed the importance of the availability of prevention treatments in their provided care packages.

> I think we [a HIC] have a very important role when talking about prevention. We think that we are one of the health insurers that goes the greatest length, seeing that we invest firmly in prevention. [..] If you're fit or sick- even when you are sick you should still be able to get the most satisfaction out of the happy moments in your day. We try to stimulate people in that.

Health insurance companies also report that they are implementing prevention programs in local communities, e.g. smoking cessation programs, lifestyle coaches. The OA mentions that it is important to have different work fields combine forces to implement prevention programs. They see the local implementation of prevention policies in communities as a stepping stone to increase knowledge on prevention issues. Two of the interviewees mentioned that they were aiming to implement prevention policies and or programs that can be used [domeinoverstijgend].

One HIC had already successfully implemented a fully working digital platform for their members. This platform is aimed at helping the user maintain a healthier lifestyle.

The technology The two HICs interviewed mentioned an increase of focus on eHealth in the last years. They say that especially during the current pandemic, eHealth initiatives have been very successful. One of the interviewees was especially concerned with how they could keep up with the increased stream of innovative ideas, while also keeping a hold on the current progress made during the COVID-19 pandemic. This recent booming of eHealth was mentioned as an eye-opener to new implementation chances for eHealth, especially in prevention and after-care. Another interviewee mentioned that eHealth was a great means to bring different domains (social and medical) to work together. As an example, they mentioned municipalities working together with GGZ or elderly care. It was stated that for the OA that eHealth implementation is an important cause and that they would help with its implementation. In two interviews the support for prevention-related eHealth programs was mentioned.

One of the more common recurring themes of the interview was that the interviewees mentioned that eHealth could be a critical factor in reducing the strain on healthcare. They mention that, in an ideal situation, eHealth could help replace hospital care with care at home or at the general practitioner. This was due to the reported increasing healthcare costs. One HIC mentioned that a lot of care already has digital components, so they see a lot of opportunities for eHealth implementation. Other changes in healthcare due to eHealth that were mentioned were: increasing the throughput or shortening of treatments, increasing availability of information to the patient, and treating or monitoring patients in their own environments where they might feel more comfortable.

According to the interviewees, healthcare providers have mixed enthusiasm about using eHealth. On one hand, some show great enthusiasm to work with it. One interviewee mentioned that their clients were busy with eHealth usage and were involved in local eHealth programs. HICs mentioned that they let their clients decide themselves whether and how they use eHealth. Some clients receive a contract (with) clause, requiring them to use eHealth for a specific or certain amount of time. On the other hand, interviewees also mentioned hesitancy around the use of eHealth. This partially stems from the fear of "an empty waiting room" and partially from the lack of knowledge surrounding digital practices. In one interview it was stated that, before eHealth can be implemented successfully, healthcare providers need help with education on the digitalization of healthcare.

While eHealth has been around healthcare for a while now, HICs are still awaiting the outcomes of the technology. The two HICs interviewed mentioned that, if they had implemented an eHealth intervention themselves, they were interested in looking into the link between outcome and usage. One of these HICs had already implemented a nationwide intervention and currently, a study is investigating whether the intervention provides any outcomes. One of the HICs mentioned that they still lack the knowledge for full implementation of eHealth, so one of their main priorities is to develop their

knowledge.

Both HICs interviewed were interested in the data provided by eHealth apps, but only if they were in charge of the intervention. Both stated that when the app would be their property, they would be interested in usability, user experience, and effectiveness outcomes and would use this data to improve the app. When the app was the property of one of their clients, one HIC replied that they would not be involved with the app as much, while the other HIC replied that they would be involved with certain evaluation moments.

Value proposition Certain elements of eHealth might be more attractive to HICs. The value proposition deals with both interests of the supply- and demand-side. In the view of a business-related case, the interviewees displayed interest in eHealth that can be used for a broad target audience or is usable for multiple kinds of treatment (e.g. smoking and alcohol addiction).

The demand-side of the value proposition deals with the desirability, efficacy, and cost-effectiveness of the technology. Again, one of the most common answers seemed to be the use of digital treatments to replace physical ones. As a result, this would decrease or prevent the influx of hospitalized care and reduce overall healthcare costs. Especially telemonitoring was seen as a preferred method of eHealth. The availability of choice for a patient was also reported as a desirable outcome of eHealth, along with the presence of a 'personal health environment' (a digital environment in which patients can see test results and other important data on their personal health). Aside from these outcomes of eHealth, the two HICs were interested in a positive user experience as well as provision of additional value to the treatment by eHealth. They say that eHealth should serve its cause and at least increase the quality of care or its effectiveness.

Effectiveness was one of the more commonly discussed elements of eHealth, especially in terms of the ability to decrease healthcare costs. In the two quotes below, the two interviewees stress the importance of this cause and how eHealth could possibly provide an answer.

> Just like I said before, we have a couple of big challenges in front of us [in the healthcare sector]. Everything that can help control that problem has our warm interest. So, of course, in terms of the job market and costs, preferably a combination of the two, is what I think is most important for health insurers.

> [..] And when people are [digitally] monitored, a health care provider can help multiple people at once, which makes their job more efficient. [..] A big part of the attention goes to the costs, but an equally big part to the job market. Those are two factors that we take into account.

To do this, eHealth should be implemented in such a way that it provides efficiency. One interviewee mentioned that efficiency, preferably, should work on both the level

of workload and healthcare costs. One example, as mentioned in the quote above, explains that the monitoring of a patient at home allows a healthcare provider to monitor multiple patients at the same time, while also being able to see any problems developing at an early stage. Before HICs start implementing any eHealth, they do look into the theory behind the intervention.

As stressed before, HICs seem to be most interested in reducing the current healthcare costs by using eHealth. The cost-effectiveness, as mentioned in the interviews, is thus mostly measured by how efficient eHealth makes certain treatments or the prevention of certain treatments from being needed. The eHealth intervention should be financially feasible before HICs are interested in getting involved.

The organization The capacity to innovate within HICs in the field of eHealth is large. As mentioned before, HICs show great interest in new eHealth developments, especially when they can be utilized to cover healthcare expenses. To stimulate these innovations, one HIC indicated that they try to make agreements on eHealth implementation with their clients. These agreements should be followed in the upcoming years. The other HIC answered that they help spread the word of certain eHealth interventions once they have been adopted by their clients. One interviewee of the OA indicated that they think that HICs do not have enough power or insight to optimally evaluate eHealth, so they provide a helping hand in the form of a global evaluation. The quote below illustrates their decision.

> Everyone was working on their own quality mark, so in favor of our members, we designed an evaluation matrix. We designed some kind of funnel through which we lead all possible eHealth applications. These apps get scored on a few criteria like (data) safety, efficiency, user-friendliness. If the app reaches the end of the funnel it gets a quality mark.

With this quality mark, HICs can feel free to continue working with the eHealth intervention in question. The OA also concerns itself with implementation on a broader scale and promotes eHealth interventions amongst other parties.

Previous eHealth implementations were mentioned by both HICs and both have clear goals in what they want to achieve with eHealth. One HIC stressed, however, that eHealth should be a means to a cause, but not a cause on its own. While digitalization of care could be beneficial, they do not speak any ambition about full digitalization.

The adoption and funding of eHealth initiatives are similar for both HICs. Often, developers of eHealth will talk with HICs representatives for funding, their clients ask whether an eHealth initiative they want to use can be insured. In most cases, involvement in the early stages is preferred. The next step involves a similar evaluation step. However, one interviewee mentioned working with the evaluation matrix of the OA, while the other mentioned a more internal process of evaluation. Both evaluations, however, focus on the same factors: user experience, safety, and efficiency. One important aspect mentioned was that the eHealth intervention should not double the work of

healthcare providers. After this evaluation phase, the healthcare provider can continue to adopt the intervention.

The wider system The regulatory context within eHealth implementation mostly deals with the evaluation matrix by the OA. In an interview with the OA, it became clear that the contact between the HIC and their organization is beneficial. With this general evaluation method, all HICs have the same standards for their eHealth. To gain insurance for the eHealth intervention, the OA answered that the intervention should be evaluated on effectiveness and outcomes as well.

For future hopes of adoption, one HIC spoke about their goal for eHealth usage to become as normal as using a cellphone. They reported that, whenever they came across a promising eHealth application, they ask the healthcare provider using the technology to become an ambassador of the intervention and share its success story with the world. This is done with the underlying intention to create a more positive public perception toward eHealth. The OA mentioned that the perception of eHealth is ever-changing. Before the current pandemic, people were convinced that old people would not be able to use eHealth, but present times have proved otherwise. The interviewed HICs see more chances in eHealth implementation due to its adaptable nature. They work on changing the image of eHealth to become more suitable for people with different demographics.

Networking is used to either gain information about new eHealth innovations or to spread the word about successful eHealth applications. One HIC even mentioned that, if they found one eHealth intervention to be working especially well, they would try to implement this intervention outside of its current region. However, they also mentioned that they are mostly hesitant to do this, seeing as eHealth is an ever-developing field of work and that nationwide implementation can be difficult. In two years there might be an even better app or technology-based intervention.

4 Discussion

This study aimed to evaluate the smoking cessation app 'Stopmaatje' by involving two stakeholder groups: end-users and health insurance companies. End-users were involved to evaluate the user experience, while health insurance companies were involved for insight into the financial implementation possibilities for Stopmaatje. For this aim, a mixed-methods approach was used in which the user experience was measured through log data analysis and a questionnaire, and the health insurance company evaluation through interviews.

The first part of the thesis aimed to find out how the users experienced Stopmaatje. The user experience of Stopmaatje showed mixed results. Negative results were obtained on the behavioral side (the log data analysis), but positive results were obtained on the cognitive side (the questionnaire). In short, the majority of the users of Stopmaatje did not return to the app after two sessions, but questionnaire results did indicate a positive behavioral intention to continue using Stopmaatje. Adherent users often returned to the app to use reward and feedback-based functions.

The goal of the interviews was to find out to what extent Stopmaatje fulfilled the requirements of eHealth implementation set by health insurance companies. The analysis presented both barriers and facilitators for the implementation of Stopmaatje. One important barrier was that HICs prioritize telemonitoring initiatives in their implementation plans. HICs aim to reduce healthcare costs and would be interested in prevention mHealth if it would serve the same cause. A facilitator was that health insurance companies invest value in good results on user experience and usability, which this thesis already focuses on.

Finally, data triangulation was used to see whether the two studies would present complementary or opposing arguments concerning the implementation of Stopmaatje. First, an important complementary finding in these two studies was user experience. HICs showed some level of interest in user experience, which was one of the factors in their eHealth evaluation matrix. Second, it was revealed that most HICs utilize an evaluation matrix provided by the overarching association. Insight in this matrix would provide valuable information on what HICs look for in eHealth.

4.1 User experience

In general, the log data analysis showed that only a small fraction of all who downloaded Stopmaatje used the app intensively by frequently logging in over an extended period of time. In contrast, more than half of the users never returned to the app after their first login. This highly skewed pattern is typical for a free-to-use and individual smoking cessation app like Stopmaatje. Other studies have shown a decrease in logins and use of features over time (Van Gemert-Pijnen et al., 2014; Arden-Close et al., 2015; Eysenbach, 2005; Goldenhersch et al., 2020). A study done by Brown, Michie, Raupach, and West (2013), showed that especially younger and more dependent smokers would be interested in regularly using an app for smoking cessation. If this is the case, changes

could be made to the design of Stopmaatje to engage this specific target group more.

There can be multiple reasons influencing the dropout of users: a failed quitting attempt (Buller et al., 2014), no interest in the app, low educational level (Kotz & West, 2009), and high levels of smoking (Zeng, Vilardaga, Heffner, Mull, & Bricker, 2015; Curtin, Brown, & Sales, 2000). A study by Yong, Borland, Cummings, and Partos (2018) showed that abstinence rates depend on levels of self-efficacy, social surroundings, and use of stop-smoking medication. They state that in the early stages of cessation people need increases of self-efficacy in quitting. Seeing that Stopmaatje is an app regularly used the first couple of days of a quitting attempt, it could be helpful to focus more on self-efficacy. Seeing the high rate of attrition, it would seem that Stopmaatje does not provide self-efficacy for a big part of its userbase. Studies showed that a smoking cessation app should keep providing fresh content to maintain user engagement and novelty (Wu, Tombor, Shahab, & West, 2017; Hassandra et al., 2017). Ubhi, Michie, Kotz, Wong, and West (2015) found that it was likely usage rates would increase if prompts would be introduced into the design. It could be insightful to dedicate more research to the specific reasons for the dropout so that Stopmaatje can adapt itself to its users.

As for the number of actions per session and duration of sessions, different results were obtained. Users with a low session number completed more actions within their session and on average spent more time in the app. This could be related to their first session, in which users tend to explore the entire app. In contrast, the more adherent users showed interest in specific features (monitor) and therefore spent less time per session. One recommendation to increase utilization is to implement, or highlight more attention, to social support features (Rosser, Vowles, Keogh, Eccleston, & Mountain, 2009; Zeng et al., 2015). Positive levels of usage have been found in smoking cessation interventions that utilize text-messaging (Spears et al., 2019), tailoring to personal needs (Thrul, Klein, & Ramo, 2015), and the ability to track progress (Hartzler et al., 2016). The results from the log data analysis partially support these claims, with both moderate and adherent users returning to the app to monitor their progress and chat and help features being in the top 4 of most used features. Personalization functions have not gained as much attention from the Stopmaatje user base. However, factors of personalization were limited in the current design of Stopmaatje.

The features that were particularly popular within the user group were: the monitor, help, game, and chat features. These features all required the user to actively provide input, of which two functions provide distraction and social support. This could imply that users do use Stopmaatje to seek help whenever they experience difficulties in their cessation attempt, while the monitor feature serves more as positive feedback. This aligns with the results of Baek et al. (2018), in which they evaluated a CVD self-management application. Users rated monitoring and support features, i.e. communication, risk assessments, and condition management, more positively. Adherent users showed more interest in these content dynamic features as well. Especially the monitor feature provided dynamic content that kept track of their progress. Interactive content is also associated with an increased amount of behavior change, compared to

passive features (Albarracín, Gillette, Earl, Glasman, & Durantini, 2005).

More static functions like tips and facts were last. However, it is important to note that different features are interesting at different stages. Contemplating users are low in their self-efficacy and need information that balances their perception of the pros and cons of smoking (Rios, Herval, Ferreira, & Freire, 2019). The tips and facts features, at this stage, are of great importance. So, while underused, these two features provide the stepping stones for a successful cessation attempt.

However, it should be noted that not all BCTs have to be utilized to construct a successful quitting attempt. Some target groups experience more effectiveness with fewer BCTs (Michie, Jochelson, Markham, & Bridle, 2009), or some BCTs are found to increase effect sizes when delivered face-to-face (Neighbors, Larimer, & Lewis, 2004). West, Evans, and Michie (2011) lists five important BCTs for high success rates: strengthening the ex-smoker identity, providing rewards on progress, advising on changing routines, assisting with coping, and asking about the use of stop-smoking medication. Stopmaatje provides three out of these five BCTs in the form of monitoring on (rewarding) progress, providing tips for different quitting tactics, and several ways of help when struggling during this period. Some BCTs are only effective in certain combinations, e.g. interventions providing information on the needed change without addressing personal susceptibility will not be as effective (Dusseldorp, van Genugten, van Buuren, Verheijden, & van Empelen, 2014). In Stopmaatje's case, facts provide some information on the health consequences of smoking, whereas the monitor provides feedback on the ongoing quitting attempt. As long as the health consequences are remembered, thus making personal susceptibility high, Stopmaatje could be successful in supporting quitting attempts.

This clear distinction between highly used features and less used features can provide information on how the features are featured on the home screen. Popular features might serve a better purpose on a more prominent spot on the home screen than less popular features. However, a more dynamic approach to the presented content might be beneficial as well. At this point, Stopmaatje provides little preparation support for the pre-contemplation stage, which does not encourage users to plan their quit attempt. However, research found that quit attempts made with no planning are at least as likely to succeed as those that are planned (West & Sohal, 2006).

The questionnaire results indicated a positive user experience score. This contradicts the low adherence scores gained in the log data analysis. Points of interest were that the 12 users thought that Stopmaatje was easy to use and not too technologically advanced. A slight consistency can be observed within the components of performance expectancy (UTAUT) and pragmatism (Hassenzahl). With the exception of two respondents, high scores on the performance expectancy component predicted high scores on the pragmatic component. According to both models, this would predict a positive behavioral intention (Venkatesh, Sykes, & Zhang, 2011; Hassenzahl, 2007). This intention was observed in the results of the questionnaire. However, this behavior is not observed in the log data, which would indicate an intention-behavior gap (Bhattacherjee & Sanford, 2009). The respondents included a low number of technology-oriented people, so

the results on whether previous experience with technology would benefit behavioral intention are mixed at best.

The goal of the user experience study was to determine what possible recommendations for Stopmaatje could be. One important finding was the high rate of user dropouts. The implementation of reminders would be a beneficial addition to the app to fight this rate (Vilardaga et al., 2016). Other sources state that, in order to enhance adherence, user engagement should be enhanced. This can be done through adding more factors of personalization (Wu et al., 2017) (e.g. more focus on a quitting scheme that adapts itself to the users, but also provides personalized advice during the attempt that takes previous quitting attempts into account) and regular content updates (Herbec et al., 2014). While the addition of the game does provide an important factor of distraction and is popular with the user group, the game could provide more engagement if it would be related to smoking. In studies done by Edwards et al. (2018) and Raiff, Jarvis, and Rapoza (2012) results showed that in smoking cessation apps, smoking-related games would be considered as more engaging by their users. Perhaps this would also increase adherence.

As pointed out in the recommendations, personalization is a factor common in persuasive system design (Asbjørnsen et al., 2019). While personalization is present in the current design of Stopmaatje, its use has been shown to be limited. It could be insightful to see whether adding more personal content would increase adherence to Stopmaatje, and perhaps also lead to effective outcomes. The positive Hassenzahl scores show that the visual design, such as the user interface, was received well. A study by Edwards et al. (2018) states that apps with a colorful and bright design work well, which aligns with Stopmaatje's interface.

4.2 Stakeholder analysis

The qualitative study of the implementation strategies of health insurance companies produced a number of important findings. The key findings are discussed below.

First, HICs are clearly interested in eHealth and mHealth as one of its branches, but primarily within the domain of telemonitoring (telemedicine) and other technology to substitute expensive clinical care. It seems that one of the main interests for investing in eHealth is to reduce healthcare costs. However, this is of little interest to the cause of Stopmaatje, which aims itself on more prevention-related problems and will not help with the cause of replacing treatments. It seems that any financial interest in Stopmaatje is dependent on cost-reducing factors that accompany it. This would make successful implementation complex for prevention-related innovations within the stakeholder group of health insurance companies. Interventions aimed at prevention prove to be costly in the short term, while profit can only be observed in the long term. This could be another barrier for health insurance companies to invest in prevention-specific innovations (Koopmans et al., 2012; Kusiak, 2016).

The second key finding is the evaluation done by the OA. In a way, the OA represents a gatekeeper position. However, it is unsure whether all HICs lead their eHealth

initiatives through this evaluation. It is most likely that eHealth, which has not been created in collaboration with a HIC involved, will be recommended to go through this evaluation. eHealth created by, or with a HIC involved in the early stages, might be exempt. After all, the OA evaluation deals with factors like user experience and safety. Effectiveness, however, must be shown in a study done by a different institution. In most cases, eHealth initiatives that are proven effective are reimbursed.

The third key finding is the interest of HIC clients, healthcare providers, in eHealth. The willingness to use eHealth of healthcare providers is an important factor in eHealth implementation. Most HICs try to increase the motivation to use eHealth through their client relationships (Vries, Kloek, Bossen, & Veenhof, 2016). However, there is still a mixed response in the healthcare provider population. While one part of the healthcare providers is excited to start using eHealth in their practices, another part dreads that eHealth will take over their job (which would contradict the issue of the heavy workload in healthcare). From recent research, however, it was found that half of the healthcare providers are enthusiastic about implementing eHealth in their care routine (Keuper & Jong, 2020). To add to this, 80% of the healthcare provider population expresses interest in implementing eHealth for prevention and self-management cases (De Veer & Francke, 2013). This enthusiasm can be increased by providing proof of value for the patient and caretaker. However, it should be noted that Stopmaatje has been designed for users and not for healthcare providers. This might prove to be a barrier to implementation through HICs.

Not only healthcare providers might be hesitant to use eHealth, but also their patients might not feel comfortable with using eHealth that is provided by their HIC. In a survey by CBS, it was stated that people fear that information that is logged by eHealth might be an incentive for HICs to increase the costs of premiums or that they will have a severe lack of privacy (CBS, 2019). However, during the COVID-19 pandemic, one interviewee mentioned that people quickly accept eHealth as an alternative form of healthcare.

Another barrier for eHealth investments is that HICs still have a careful attitude toward eHealth investing - even if they do implement and invest, they only implement it in one area (Boon & Sloots, 2018). This was mentioned in one of the interviews as well. HICs know that eHealth is a rapidly developing field in healthcare and are hesitant to implement an eHealth initiative nationwide. Especially a smoking cessation application like Stopmaatje is not likely to reach nationwide implementation.

Lastly, HIC involvement differs on two factors: is the app their property, and have they been involved in the early development? Whenever eHealth is their property, HICs show more interest in user experience and usability. Otherwise, they are likely to show some interest during annual evaluations. A highly involved HIC is likely to aim for regular content updates. Early involvement would be of financial advantage. The HIC would be able to give advice on design and early implementation initiatives, which would provide the eHealth with a good start once it is finished.

For Stopmaatje this would mean that for successful implementation the app should fulfill certain criteria: user experience, safety, effectiveness, early involvement, and

ownership. Stopmaatje could create an interesting business case if it could add efficiency too, or partially replace, an existing smoking cessation treatment. According to the information gathered from the interviews, this would be a key motive for investments. To scale up, Stopmaatje could reduce complexities in the domains of the technology and the value proposition by working on effectiveness and user experience, as well as dedicating research to healthcare providers specifically. However, it should be noted that complexities concerning the domains of the condition and the organizations seem to be out of bounds. The focus on telemonitoring and HIC hesitancy to implement cannot be countered by changes made to the app or implementation agenda.

4.3 Comparing user experience and stakeholder findings

The important aspect of mixed methods is the triangulation of results. The goal of the data triangulation was to uncover what improvements were needed to make Stopmaatje a more attractive option for both users and health insurance companies.

Health insurance companies have shown interest in eHealth. In the interviews, certain factors of interest arise: accessibility to a broad target audience, cost-reduction by implementing transmural care, positive user experience, and effectiveness. These factors of interest can be used to design mHealth in such a way, that HICs will be more favorable to invest. This study assessed the user experience of Stopmaatje. While the assessed user experience showed positive scores on both models, the log data results showed low usage and low adherence to the app. The question remains if effectiveness and accessibility would increase when Stopmaatje would be implemented through a HIC or that these two factors would remain stagnant. Adherence has not been mentioned in the interviews.

With this in mind, Stopmaatje would benefit from improving on the current design. Building upon existing literature on which elements produce positive outcomes in smoking cessation, adding more elements of distraction, personalization, and social support could improve adherence.

However, further triangulation of results was not deemed possible. There were a few common factors in both studies, but not enough to come to a clear conclusion. In short, instruments for both studies were not a priori designed with the purpose of finding complementary or opposing findings.

4.4 Limitations

Building on the results of this study, some limitations must be pointed out. First of all, the questionnaire results have been analyzed qualitatively due to the low number of responses. This means that the results are not generalizable to the entire population of Stopmaatje users. The scores indicate a positive user experience, but future research is needed to see whether these user experience conclusions hold. The results of the questionnaire could not be connected to the log data. Respondents indicated a positive behavioral intention to use Stopmaatje, but the log data showed low overall usage.

However, seeing this study mainly focused on user experience, this effect might be more interesting to see in an effectiveness study. It is important to look into the combination of both fields of research. Associating outcomes with usability should be treated with caution. An engaging and easy-to-use app does not have to be effective (Ubhi et al., 2015).

The second point of limitation is that the UTAUT and Hassenzahl models are meant as separate user experience models. No studies were found that used these two models together for user experience research. While both models are meant to measure user experience, they consist of different components. There is some overlap, the pragmatic and performance expectancy factors, but the other four factors seem to provide added value when used together. For example, the hedonic variable of the Hassenzahl model provides information on emotional values through technology usage (Hassenzahl, 2007), while the social influence variable provides information on the influence of social circles on technology usage (Venkatesh et al., 2003). The combination of aesthetics and user experience remains unexplored in user experience research, which would make an argument in favor of looking into the combination of UTAUT and Hassenzahl (Van Schaik, 2009). For this study, two questionnaires based on the models were put together, without checking for overlapping variables. More time could have been dedicated to the development of the instrument. However, the limited availability of research on the combination of these two models was a limitation from the start.

In the stakeholder analysis discussed in this study, one party was interviewed that could be defined as a third stakeholder itself. The association, while having similar views on eHealth as the two HICs interviewed, has different motives and a different role in the healthcare system. Their main function is to support HICs to realize affordable and accessible healthcare. While their input has been valuable, they are not directly involved in the implementation process of eHealth. For this stakeholder analysis, the perspective of a health insurance company was used to build the instrument. This instrument would not be optimal for this second type of stakeholder. A better perspective on their policies and organizational strategies could have been gathered by preparing two different instruments (Brugha & Varvasovszky, 2000). However, in most stakeholder analyses in mHealth fields, a similar interview guide was developed for different stakeholders (Petersen, Adams, & DeMuro, 2015; Lavallee et al., 2020).

It is important to point out that two of the domains of the original NASSS framework were not included: the adopter and embedding and adaptation over time. This was done because the interviewed HICs would not be involved in the adoption process, so they could not provide information on the specific changes happening when adopting eHealth. This domain would be of more importance when interviewing a healthcare provider. The same argument holds for embedding and adaptation over time. A more involved organization would have provided different and more specific insights for this domain. The other five domains were included in the coding and analysis.

Lastly, an important limitation in this study is the data triangulation. In most cases, triangulation is used to study the same phenomenon (Hussein, 2018). While Stopmaatje had a central position in both studies, the subject revolving around it was

different. The user experience and stakeholder analysis studies were not created to match each other, which made triangulation hard. While findings from both studies are of a valuable nature, there is little room in which results can actually be compared. This is most likely caused by the instruments not measuring the same constructs. A more accurate triangulation is seen in the user experience study, where log data and questionnaire responses are combined to come to design recommendations. Combining qualitative and quantitative data remains a challenge. Foss and Ellefsen (2002) state that when using both qualitative and quantitative methods in one study the researcher should have a clear understanding of the to be researched phenomenon. Where data triangulation is mostly used to gain an understanding of completeness, this study tried to use it for broadening the understanding (Norman, Redfern, Oliver, & Tomalin, 1994).

4.5 Recommendations

The findings of this study can be used for the further development of Stopmaatje and its implementation plans.

First, user adherence has room to be increased but will need further research. It would be interesting to see what results would come out of more in-depth usage patterns research and if there are more and significant differences between low and high adherent users. These results can be used to further improve the design of Stopmaatje and to identify user characteristics that influence adherence. Another field of interest would be the current userbase of Stopmaatje. The reasons for dropout are still unknown and require insight before solutions can be synthesized. Furthermore, due to the limited responses to the questionnaire, more research can be dedicated to both the Hassenzahl and UTAUT models. A more qualitative approach might benefit future results as well.

Second, more insight on mHealth implementation can be gained through other stakeholders than health insurance companies. The interviews showed that health insurance companies provide eHealth for their clients. This means that Stopmaatje can also be promoted through the clients themselves.

Third, the original intention of this study was to apply a mixed-methods approach to both studies. This has experienced barriers. For future research on such a mixed-methods approach, it should be taken into account that materials for both studies will need to be designed a priori.

4.6 Conclusion

In conclusion, it can be said that both the user experience study and the stakeholder analysis provided valuable insights into the future implementation of Stopmaatje. First, it was found that participants indicated a positive behavioral intention to use Stopmaatje, but that this intention was not translated into actual behavior. Stopmaatje experienced similar attrition rates compared to other smoking cessation applications. Changes to the interface can be made to cover the observed intention-behavior gap. Second, it was found that Stopmaatje experiences both barriers and facilitators with

implementation through health insurance companies. While these stakeholders do show increasing interest in the implementation of mHealth, their focus lies on decreasing healthcare costs through telemonitoring applications. For mHealth to be implemented, health insurance companies showed interest in research on both user experience and usability, as well as proof of effectiveness. Third, Stopmaatje can create an interesting business case for both users and health insurance companies by adding efficiency to its interface. If adherence of users can be increased, and thus overall usage of the app, this might lead to an increased incentive for health insurance companies to invest.

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A UX questionnaires

A.1 Questionnaire: UTAUT

Performance expectancy

1. Ik vind Stopmaatje nuttig om te gebruiken bij een Stoppoging
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

2. Door het gebruik van Stopmaatje wordt mijn stoppoging makkelijker
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

3. Ik kan Stopmaatje aanpassen aan mijn voorkeuren
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

4. Stopmaatje maakt mijn stoppoging niet efficiënter
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

5. Stopmaatje biedt veel verschillende functies aan om mijn stoppoging aan te pakken
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

6. De feedback die ik van Stopmaatje krijg vind ik nuttig
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

Effort expectancy

1. Ik vind Stopmaatje moeilijk om te gebruiken
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

2. Ik vind het duidelijk waar de verschillende functies in Stopmaatje voor bedoeld zijn
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

3. Het kost veel tijd om Stopmaatje te gebruiken
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

4. Stopmaatje vraagt om veel nieuwe vaardigheden om te kunnen gebruiken
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

5. Stopmaatje past zich aan jou aan
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

Social influence

1. Mijn gebruik van Stopmaatje wordt als positief ervaren door mijn familie en vrienden
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

2. Mijn gebruik van Stopmaatje wordt als positief gezien door mijn werkgever
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

3. Stopmaatje zou door mijn collega's gebruikt kunnen worden
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

4. Ik zou Stopmaatje aanraden bij mijn familie en collega's
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

Facilitating conditions

1. Ik vind Stopmaatje technologisch gezien te geavanceerd
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

2. Stopmaatje past niet bij mijn stopgedrag
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

3. Ik vind het fijn dat Stopmaatje gratis is
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

4. Stopmaatje past niet bij mijn doelen
   O Helemaal oneens O Oneens O Neutraal O Eens O Helemaal mee eens

A.2 Questionnaire: Hassenzahl

Pragmatic

1. Ingewikkeld design O O O O O Duidelijk design

2. Maakt stoppen makkelijker O O O O O Maakt stoppen moeilijker

3. Efficiënt O O O O O Inefficiënt

4. Moeizaam bij gebruik O O O O O Makkelijk bij gebruik

5. Verwarrend gebruik O O O O O Duidelijk gebruik

6. Juicht het stellen van doelen toe O O O O O Bemoeilijkt het stellen van doelen

7. Logische design O O O O O Inconsistent design

8. Irrationeel gebruik O O O O O Intuïtief gebruik

Hedonic

1. Inspirerend gebruik O O O O O Beperkend gebruik

2. Amateuristisch design O O O O O Professioneel design

3. Frustrerend gebruik O O O O O Enthousiast makend gebruik
4. Geloofwaardig design O O O O O Ongeloofwaardig design
5. Ontmoedigend gebruik O O O O O Bemoedigend gebruik
6. Juicht het stellen van doelen toe O O O O O Ontmoedigt het stellen van doelen

B Interview Guide

The interview guide used for the interviews. Note that the interviews were semi-structured.

- Wat is jullie huidige policy omtrent preventie?
- Wat vinden jullie, als organisatie, van eHealth?
  - Wordt het veel gebruikt door jullie cliënten en patiënten?
- Op wat voor een manier zou eHealth de zorg veranderen?
- Hoe zien jullie de implementatie van eHealth over 3 tot 5 jaar?
- Wat vinden jullie de waarde van mhealth voor het algehele zorgsysteem?
  - Voordelen tegenover fysiek?
  - Effectiviteit verschil?
- In wat voor eHealth hebben jullie al geïnvesteerd?
- Wat zijn voor jullie belangrijke voordelen van het investeren in eHealth?
  - Intellectual property? Data?
- Hoe loopt de beslissing van het implementeren/financiëren van eHealth?
  - Welke afdelingen zijn daarbij betrokken?
- Aan welke standaarded moet eHealth voldoen?
  - RIVM certificaat?
  - Hoe wordt dit gecheckt?
- Hoe kan eHealth (voor financiëring) het beste worden aangeleverd bij jullie?
- Wat is het lange termijn beleid voor het aanbieden van eHealth? Hoe wordt dit verankerd?
  - Budget voor in de lucht houden van app?
  - Updates van de app?

C Coding scheme

Table 8

Coding Scheme.

Name code	Definition	Frequency
The condition	This domain was originally defined as the illness. This code was given to mentions of either the smoking population or to activities undertaken to manifest prevention.	12
The technology	This domain entails materials, data, knowledge, and supply features of the technology. Anything that affects or is affected by eHealth received this code.	69
The value proposition	This domain is concerned with desirability, efficacy, and cost-effectiveness of the discussed technology. Anything that considered whether eHealth was worth developing was given this code.	54
The organization	This domain is concerned with whether the organization is ready for innovation and how they would fund such a innovation. Anything that was concerned with the financial side of eHealth, decisions to implement/fund eHealth was given this code.	42
The wider system	This domain is concerned with the political, regulatory, and professional aspects surrounding the implementation. Anything that dealt with bodies outside of the current organization was given this code.	50
Total		227

D UX Results

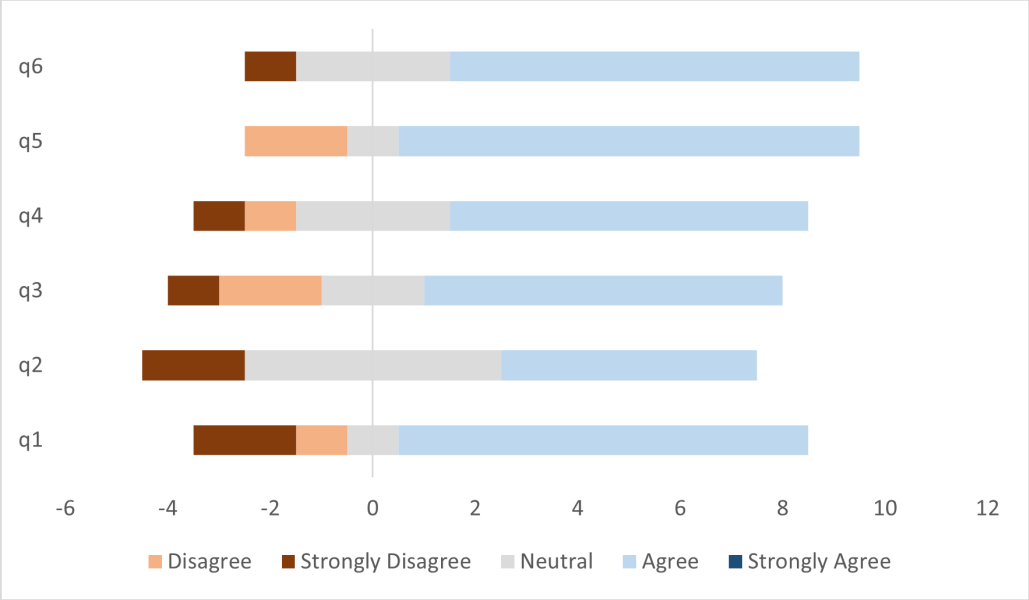

Figure 10. Scores Of Performance Expectancy Per Question (n = 12).

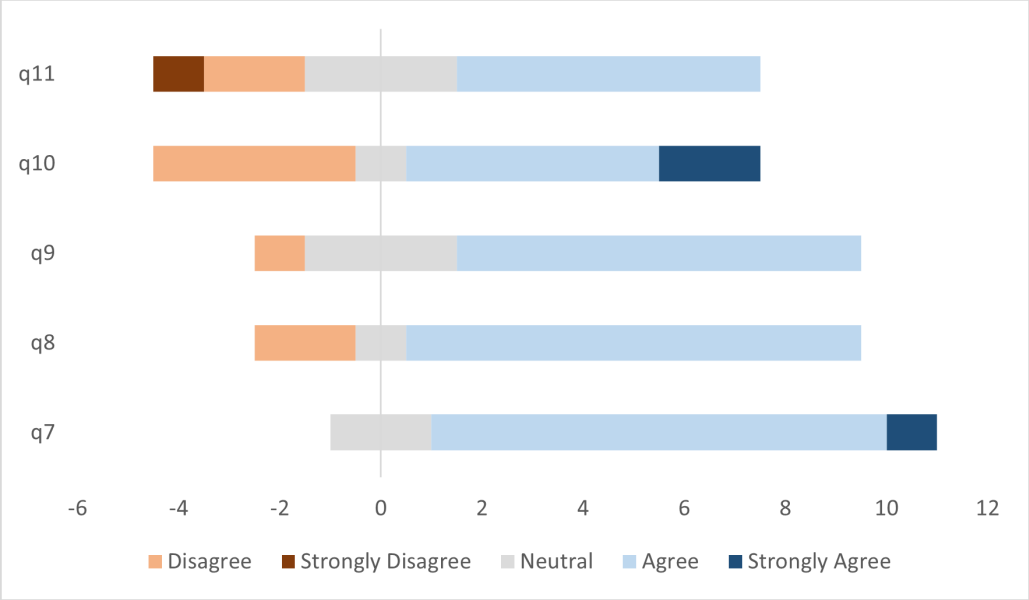

Figure 11. Scores Of Effort Expectancy Per Question (n = 12).

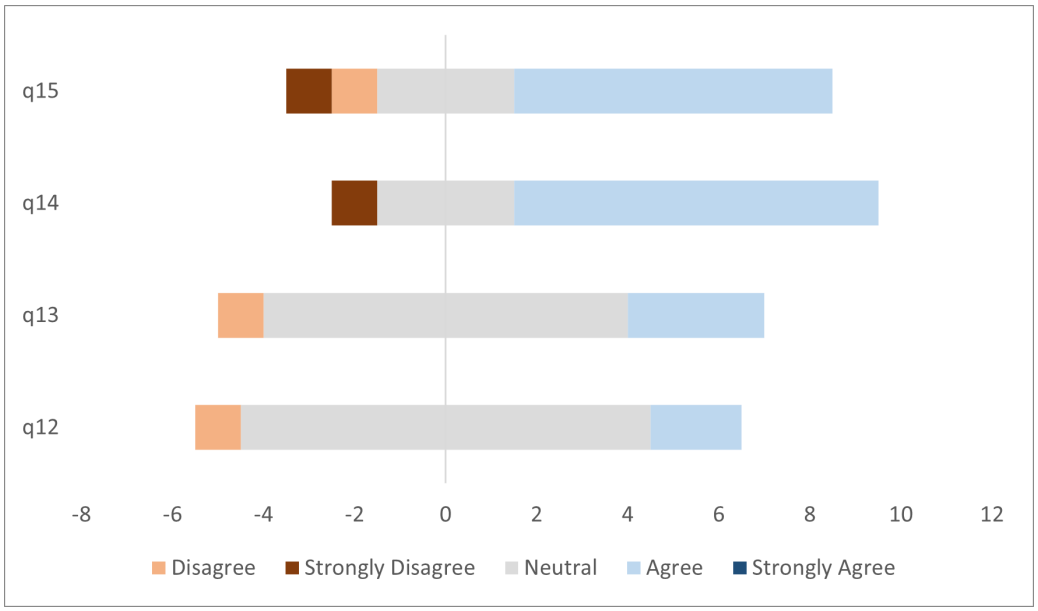

Figure 12. Scores Of Social Influence Per Question (n = 12).

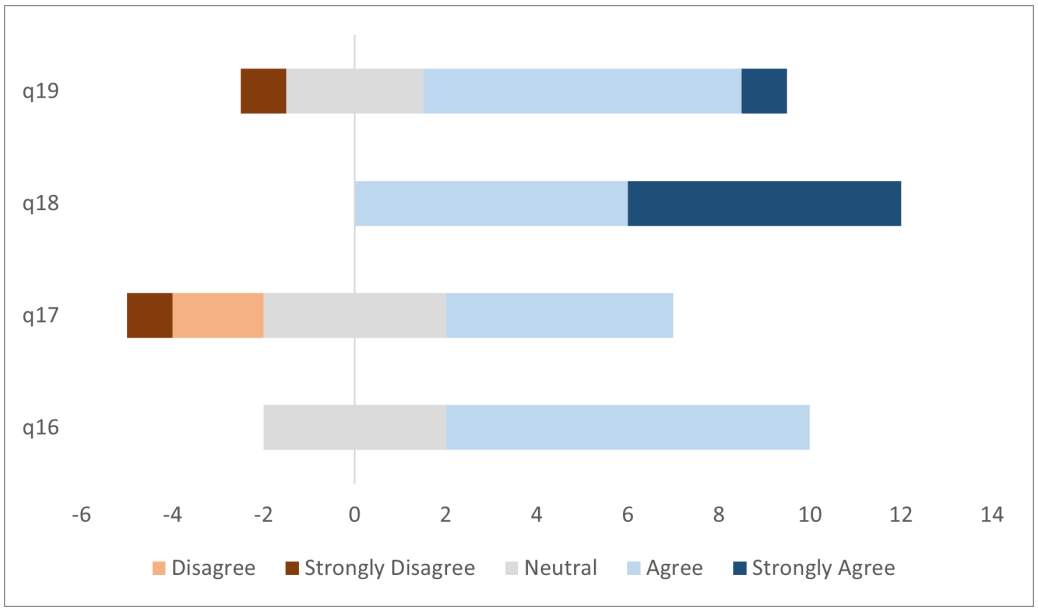

Figure 13. Scores Of Facilitating Conditions Per Question (n = 12).

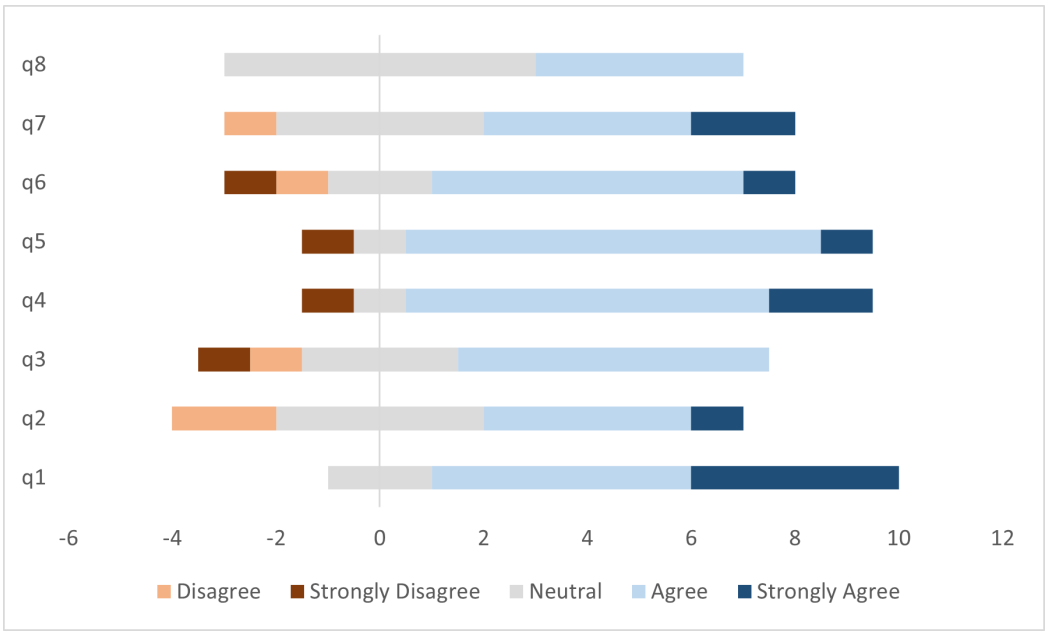

Figure 14. Pragmatic Scores Per Question (n = 11).

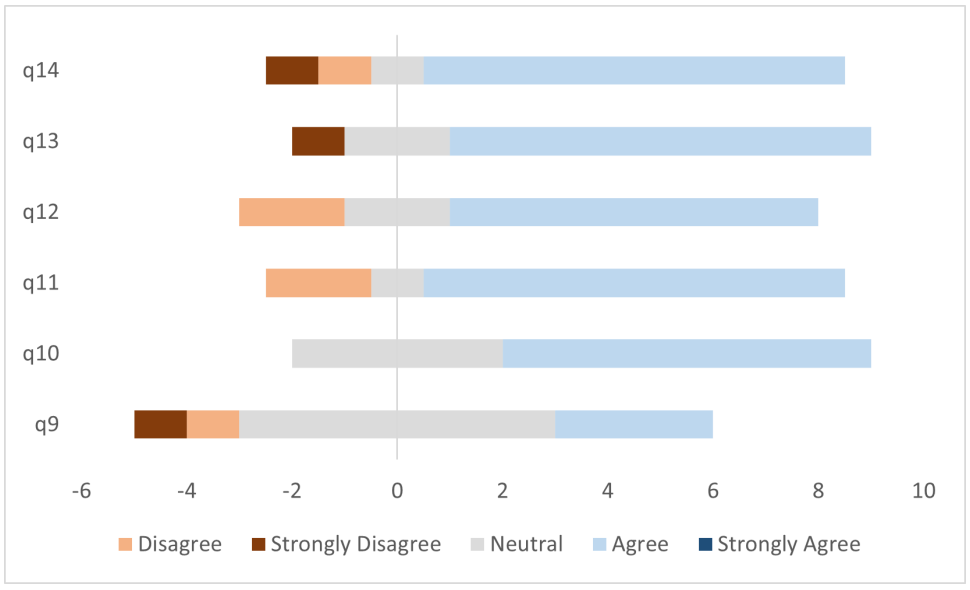

Figure 15. Hedonic Scores Per Question (n = 11).