

DESIGNING SMOKING CESSATION TECHNOLOGY

A USER-CENTERED APPROACH



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ABSTRACT

This Master's Thesis uses a user-centered approach to designing smoking cessation technology; by conducting multiple focus groups and design workshops, the research team was able to gain knowledge on how technology can help within this context.

Overall, 12 issues were found, that should be considered when designing and developing technology in order to support people who are struggling with a smoking addiction. These issues were presented in the design workshops, in order for the participants to devise useful ideas on how technology could aid and support them.

In combining the findings from both the focus groups and design workshops, the research team was able to create a low-fidelity prototype, using smartphone technology to support users in this context.



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RESUME

This Master's Thesis focusses on the issue of smoking cessation, and how mobile technology can play an important role, when preparing or trying to become smoke-free. The study presented, is an extension of our 9th semester study, conducted at The University of Melbourne. In this study we make use a user-centered design approach in order to get a better understanding on the context of smoking and quitting.

The people picked for this study had to be currently or previously been smoking on a regular basis. 18 participants from North Jutland, Denmark, were invited to take part in the study. 11 of the participants was male and 7 of them female, ranging from 20 to 61 in age. The sample includes 5 people that were considering quitting, 5 that tried to stay quit, 4 that considered themselves as a non-smoker and 4 that were currently not interested in quitting.

In the focus groups we were interested in learning about the participant smoking habits, their perception of smoking, the issues related to smoking, their use of mobile technology and impression of an existing smoking cessation application. Through a thematic analysis, the study reveals 12 issues that needs to be considered, when developing technology for this context.

The 12 issues were later used in a design workshop, where half of the 18 participants took part. In the workshop, each of the issues was presented to the participants in order for them to come up with sketch ideas on how technology could be applied, when preparing or trying to stay smoke-free.

After conducting focus groups and design workshops, we reflected on the findings gathered and created a design exemplar that is truly user-centered. The design exemplar uses smartphones as a platform, in which personal gains and losses are presented to the user to motivate for different quitting stages. By presenting information that focusses on a health and economical domain, the user will more likely be motivated towards quitting and/or trying to stay quit.

In conclusion, by doing a user-centered design approach, we discovered 12 issues, that should be considered when designing and developing supporting technology for smoking cessation. These issues considers *Quitting Stage*, *Immediate Impact*, *Personalised*, *Adjustable*, *Reminders*, *Self-Monitoring*, *Novelty*, *Meaningful Rewards*, *Social Support*, *Solo Struggle* and *Completion*. A multitude of these issues, have been supported in previous studies or theories. However, 2 of the discovered issues were not encountered in our literature review. The issues in question are *Solo Struggle* and *Novelty*. In trying to quit smoking, the participants stated the importance of being able to quit by themselves, in which technology could aid support. In order to capture users' attention, it is important to create novel approaches, technology, content and ways of interaction, which can also help to increase motivation. Another interesting finding, is the phenomenon of 'tailoring', that is often used within the HCI field, is a more finely grained concept with a multitude of facets in this context, including *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised* and *Meaningful Rewards*. By combining findings from both sessions, we have been able to create a user-centered low-fidelity prototype, concerning multiple of the issues and ideas that could be supportive when attempting to quit smoking and/or trying to stay quit.

PREFACE

This report describes a Master's project on the 10th semester of Informatics at Aalborg University. The project was conducted in Denmark during spring 2014 as an extension to our 9th semester project, "Persuading People – Using Technology to Change Health Behaviour" [4].

The purpose of this project is to look at mobile technology from a user perspective, within a smoking cessation context. By the use of multiple focus groups and design workshops, involving 18 participants, we try to uncover how mobile technology can play a central role, when preparing or trying to give up smoking. This entails the important issues that needs to be considered when developing technology for this context. The findings from the each of these sessions will be discussed in depth throughout the report. By considering the knowledge gained from the user involvement, we develop a design suggestion that is truly user-centered.

In regards to the making of this project, we would like to thank the 18 participants involved for their time and interest in the study. We would also like to give a special thanks to the participants in the first focus group, who provided useful feedback, both in regards to the area of smoking and the focus group approach, which helped shape the focus groups thereafter. Furthermore, we would like to thank the Danish Health and Medicines Authority and Sundhedscenter Aalborg that helped us advertise and recruit for the study. Lastly, we want to thank our supervisor Jeni Paay for constructive support and feedback throughout the project period.

The project was conducted from the 2nd of February till the 10th of June 2014.

READING GUIDANCE

In the first chapter of the report, we describe the purpose and theme of the study that leads to a definition of the problem area.

The introduction is followed by a research paper, describing the research study. The paper focuses on a user-centered approach for designing smoking cessation technology. The paper within the report is written in an ACM Archive Format, which is used when submitting CHI Papers and CHI Notes for conferences. The research paper can be read independently.

Following the paper, we present a study findings chapter, where we describe all the interesting findings that were gathered throughout the study. Each finding will be described in a detailed manner, extending upon the knowledge that were outlined in the paper.

In the concluding section we summarise the approach, outcome of the study and the contribution, within the domain of HCI technology and smoking cessation. Finally, we describe future work that is needed in order to gain a complete understanding of the context and how technology can play a supporting role.

We have appended our reflections (Appendix A) on the experiences and lessons learned from our Master's project at Aalborg University. This includes the methods and approaches used in the study, recruitment of participants and working with smokers. This is included in the printed report because it provides the reader with additional thoughts and reflections on the topic at hand. We have also appended a bibliography (Appendix B) of all the literature that has been read for this project, both in terms of what has and has not been included within the report and research paper. Additional appendices (Appendix C), used in this study, are listed in the end and can be found on the attached CD.

The references used within the paper and in the report are separated in for the paper to be able to be independent.

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INTRODUCTION

The case of smoking cessation is an issue, which has been a focal point in a large number of countries, including Denmark where this study has taken place. An example of this is the pictures that are found on cigarette packages, informing people of the risks of smoking, in an attempt to make people stop smoking. The increased focus on smoking cessation can be attributed to the knowledge we have gained throughout the decades in regards to the negative health impacts that the smoking of cigarettes causes. These issues includes the risk of getting cancer, heart diseases, lung problems and poor blood circulation. New research has shown that, 25% of all annual deaths in Denmark are caused by smoking with a yearly loss of 7.5 billion DKK in treatment expenses. Due to the health issues and economical impact, multiple health organisations are trying to reduce the number of smokers. This includes stopping people from beginning to smoke and helping people that are already smoking on a daily basis. Since 2005, the amount of people smoking in Denmark has been declining, from 26 percent to 17 percent [11]. The numbers also show that 60 percent of daily smokers wish to become smoke-free and 9 percent are planning to quit within a month. According to the study, half of the people wanting to quit wish to get help in accomplishing this goal.

Previous studies within HCI and Health Behaviour Change have focused on a variety of different technologies for supporting users, in their attempt to quit. A common example, is the use of smartphones [1], which can become a resourceful platform to help users. Since the introduction of iPhones in 2007 [12], smartphone ownership has become widespread, where 70 percent of the Danish population own one [2], making it a relevant tool for smoking cessation systems. Because of well-established marketplaces for applications, such as Apple's App Store and the Google Play Store, it is possible to make software that users can easily get access to. Currently, users are able to access a wide-variety of smoking cessation apps on these platforms, most of which have never been evaluated for efficacy, creating a gap between research and practices [3].

This report presents a study conducted on our 10th semester, at Aalborg University, as a continuation of our 9th semester project, which focused on assisting people within the same context. This project uses a user-centered approach in order to fully understand, what is important when trying to give up smoking.

PROBLEM AREA

By using a user-centered approach, we aim to get a better understanding of smoking cessation and how technology can play an important role when supporting people during a quitting attempt. In this study, participants at different quitting stages and age groups were involved, to contribute insight and discussion points in respect to their experiences with the issues of smoking cessation. This user input is then translated, by us, as interaction designers, into a low-fidelity exemplar prototype design created through this highly user-centered design approach.

RESEARCH PAPER

A USER-CENTERED APPROACH TO DESIGNING
SMOKING CESSATION TECHNOLOGY

A User-Centered Approach to Designing Smoking Cessation Technology

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ABSTRACT

Finding ways to help people quit smoking is a high priority issue in health behaviour change research. In addition to smoking organization websites and government-funded community counselling programs, there are multitudes of smoking cessation apps currently available with the intention of supporting people who are trying to quit. However, we cannot find evidence that these apps are based on health behaviour change theories or empirical research. In this study, we investigate ways in which technology, e.g. smartphones, can support people while they try to quit. In a user-centered approach, we conducted multiple focus groups, which resulted in a set of issues important in smoking cessation. These issues were then presented to smokers during design workshops, who used them to seed ideas on how technology could help them during their quitting attempt. Our contribution to HCI is the user-centered design of an exemplar health behaviour change technology, specifically a low-fidelity prototype smoking cessation app for smartphones that is built on empirical research. We suggest that the issues and findings within this study can form the basis of alternate designs for this domain.

Author Keywords

Smoking cessation, participatory design, focus group, design workshop, mobile technology, qualitative research.

INTRODUCTION

In Denmark, 25% of annual deaths are caused by smoking [30]. The habit of smoking can cause multiple health issues such as cancer, heart disease, chronic obstructive pulmonary disease, and poor blood circulation. Smoking also has a great economical impact on society; the latest numbers showing a yearly cost of 7.5 billion DKK [31]. Due to the numerous health effects, multiple health organisations are trying to reduce the number of smokers; both by preventing people from starting in the first place, and helping those who smoke to reduce and/or quit. However, on a lighter note, the amount of people who smoke on a daily basis is slowly declining and in North Jutland, where this study has been conducted, the amount of daily smokers has declined from 21,6 percent to 17,1 percent since 2010 [30]. It may even be possible to further reduce this number, as 73,6 percent of all daily smokers in North Jutland wish to stop [30] and with the right support we might be able to ease their transition from smokers to

non-smokers, which is why this research study is timely and of value to the community.

Since the introduction of smartphones, ownership of these devices has risen sharply. The latest statistics from Gallup¹ report that 70 percent of the Danish population currently own a smartphone device [5]; it is a device that is constantly evolving to become more versatile, with an extensive array of new functionalities and built-in sensors designed to cater to the user experience, which makes it an attractive developer platform with many possibilities. Widespread ownership and ever-evolving devices make these a relevant tool for smoking cessation software and because of well-established app marketplaces, owners of these devices can easily gain access to these apps. We have therefore decided to make smartphones the technology platform for our study. That being said, we have not discouraged other technologies during the participatory involvement of users.

Previous studies call for the need to investigate the gap between research and practice, as many available smoking cessation apps have never been evaluated for efficacy [1][7][2]. Backinger, et al. [7] state that emerging technologies, such as smartphones, have the possibility to offer resourceful means to help within a smoking cessation context. In regard to there being a gap between research and practice, we did not find any literature that involved the actual users in the design process, to better understand their needs within the context. To address this shortcoming, we used a user-centered design approach to gain a full understanding of how technology can help people to quit smoking.

This paper is structured in the following way: firstly, we look at related work in the domain of technology and smoking cessation to gain an insight of what has been done in this area. We then describe the methods used for our study, including the recruitment of participants and our research approach. This is followed by a description of the study participants and the data analysed. We then give a description of the findings gathered from the user study sessions, including a list of smoking cessation issues and sketches produced. Based on the findings, an exemplar prototype design is presented. In the concluding part of the paper, we discuss findings, future work and limitations of the study.

¹ A market-leading analysis and consulting company in Denmark.

RELATED WORK

Several studies surrounding smoking cessation and technology have been conducted within the field of HCI. When planning our research study, we read a total of 92 papers and other literature, to gain an overview of the current state of the art in this area. After conducting this literature survey, we can state that there are many systems out there, both commercial and research driven, that provide smoking cessation assistance using technology. Surprisingly, none of the systems we looked at based their designs on user-centered or participatory design practices. We therefore decided to explore this gap in current HCI knowledge, by applying user-centered design methods. Rogers, et al. emphasise in their book “Interaction Design: Beyond Human-Computer Interaction” a need for a user-centered design approach [32]. They state that real users and their goals should be the driving force behind development of a product. As a consequence, a well-designed system will make the most of human skill and judgment and will be directly relevant to the work in hand, and will support rather than constrain the user. This justifies the use of a user-centered design approach.

In a recent study in which we were involved [9], a smoking cessation application was created that offered three different types of content (tips, stories and motivators), labelled as being recommended by either an expert or by fellow smokers within the community. The study concluded the importance of using mobile technology, due to the feedback and interest we received. Participants were very interested in contributing to and improving the application, based on their own experiences with the app, and the struggle of quitting smoking. The study suggests that in order to make an application useful, it has to consider the users’ special needs by tailoring content directly to their life situation. This includes a consideration of both their quitting stage and demographics. An important finding from the study is using reminding messages, which were shown as both a useful and positive reminder of what they are trying to achieve. However, the study also shows different wishes when it comes to the app, such as using social media, tracking and games.

Several studies focus on the use of mobile technology within smoking cessation. In 2009, Abroms et. al. reviewed available smoking cessation apps on the iTunes store (47 apps in total) and found little correlation between established guidelines within smoking cessation and the apps available. They recommend current apps to be revised and future apps are developed based on evidence-based practices [1]. Again in 2012, Abroms et. al. did a content analysis of popular smartphone apps for smoking cessation (400 apps in total) and concluded that these could be improved by better integration with the Clinical Practice Guidelines and other evidence-based practices [2]. Besides evaluating apps, other research studies have created apps with a variety of focuses, in order to support people. Ploderer, et al. focused their research on social support [26][27][28] and Valdivieso-López, et al. focused on “healthy games” [41], both studies used smartphone and apps as their technology subject.

METHOD AND DATA COLLECTION

This study used online surveys, focus groups and design workshops as data collection methods. When signing up to participate in the study, each participant was sent an online survey to gather information about them before the focus groups. In the initial part of the survey, we ask demographic questions such as age, the city they live in, occupation and stage of quitting based on the TTM model (Transtheoretical model) [29]. This was followed by questions that covered their smoking habits in order to determine their nicotine dependence using a shortened version of the Fagerströms test [40]. We were interested in learning why they smoke, when they usually smoke, if they had ever tried to quit, and their motivation to quit. Lastly, we asked the participants what (if anything) they had previously used to try and become smoke-free.

Participants and Recruitment

The recruitment of participants was conducted during a two-month period based on a snowball recruitment method [14]. This was done partly by the use of a website which briefly described the project and gave visitors an opportunity to sign up for the study. The website was advertised through social media (Facebook, Twitter and forums), Google AdWords, physical posters and business cards. The Danish Health and Medicines Authority agreed to help us recruit by placing an online advertisement on one of their websites for smoking cessation (stoplinien.dk). Recruitment was also aided with the help of Aalborg Municipality who recruited participants at weekly smoking cessations courses. Participants in the study had the chance of winning a small prize (movie tickets or a dinner for two) to encourage people to sign up.

Each participant had to meet basic criteria in order to be included. They either had to be currently or previously smoking, and they were required to own a smartphone in order to be able to reflect on the use of this technology

The study had 18 participants from North Jutland, Denmark, which were either currently, or previously smokers: 11 males and 7 females. Their ages ranged from 20 to 61, with an average of 31. In this sample of people, 13 have previously tried quitting whilst 5 have never tried to quit. The average of years they have been smoking were 11,66 ranging from 1 to 40 years. In terms of smoking stages, 5 were considering quitting, 5 trying to remain abstinent, 4 considered themselves as being a non-smoker, and 4 were not interested in quitting. The nicotine dependency of the participants that considered themselves as smokers, based on the Fagerström test, was that 2 had a score of 0 (no dependence), 6 had a score of 1-2 (very low dependence) and 6 had a score of 3 (low to moderate dependence) with an overall average of 2,14.

The study was conducted in Denmark during Spring 2014, including two phases, being 4 focus groups and 2 design workshops in which we applied methods from [20]. The sessions lasted approximately 1.5 hours, and involved different activities and discussion points.

The focus groups began with an icebreaker, using a word-association task: asking participants which words came to mind when hearing the words “cigarettes” or “quit

smoking”. The group then discussed their responses. We questioned participants on what they liked about having a cigarette and why they began smoking. In the next part of the session, we were interested in their smoking habits, including reasons for smoking, situations, and places where they do and do not want to smoke, where they keep their cigarette packets, and what they consider the upsides and downsides of smoking. We were also interested in learning if they had tried to quit before, what they learned from the attempt, what their reasons were, their strategies, the difficulties they foresaw, and where they would try and get help, if at all. In the second part of the session, we investigated their smartphone usage habits, choice of apps, and whether they had tried using a smoking cessation application before. If participants had not tried these kinds of apps, we showed them an example of one named “QuitNow - My Quitbuddy” to get their impression of it. This app was chosen due to the multiple functionalities it offers to help people trying to quit smoking. In addition, we were interested in knowing if social networks could be used in the context of quitting and how participants used social media. As a final task, participants were presented with a gain and a loss-framed message to get their perception of these messages, and see how they responded to both positive statements about the benefits of quitting and negative facts about how smoking causes illnesses.

The design workshops involved half of the total participant pool. The goal was to gain a better understanding of how the findings from the focus groups could be applied to the design of an app, by allowing participants to review, discuss and reflect on them and apply them as inspirations for their sketch ideas for smoking cessation technology. During the workshops, we gave a small introduction, explaining the approach of the session, the list of issues and some simple sketching theory based on Buxton’s 11-point list of “What sketches are...” [10]. The participants were asked to collaborate in creating ideas and sketches of technology and situations in a smoking cessation context, while discussing the findings. While sketching, we asked the participants about their approach, what led them to their design, what findings were involved, and whether the findings covered the areas of quitting important to them.

Data Analysis

For the analysis we recorded each session on audio and/or video to be reviewed by researchers and transcribed. In the data analysis we applied a selection of coding techniques from Grounded theory [21][38]. Open Coding was used during analysis to mark significant and important points from the participants. By applying an iterative thematic analysis approach [8], using an affinity diagram [32], lists of themes were discovered. In some cases, findings were considered of minor or no relevance and therefore excluded. Each focus group session was analysed by each researcher to achieve concordance and to get different perspectives and assure all the important statements were covered.

FINDINGS

This section presents the findings from our study. These were derived from the focus groups and design workshops with the participants, resulting in a set of issues important

in smoking cessation and sketches that lead to an exemplar low-fidelity prototype design.

Focus Group Findings

Through our coding analysis, 40 different phenomena were discovered. The findings were further synthesized into 12 main themes that were translated into smoking cessation issues for consideration in designing related applications. In this section we will present and describe each of these issues and relate them to previous research in this area where applicable. The 12 issues are: *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised*, *Adjustable*, *Reminders*, *Self-Monitoring*, *Novelty*, *Meaningful Rewards*, *Social Support*, *Solo Struggle* and *Competition*.

Quitting Stage

This issue surmises the importance of knowing which quitting stage you are designing for; you could, for example, take inspiration from the TTM model [29]. All the participants were at different quitting stages and all expressed different needs in regards to, for example, finding motivation to quit smoking and what support they needed during this. One participant said: “*I think that it is fine that we have some campaigns that runs on the television, but it is not something you should place within an app that people who smokes should have*”, the participant expressed that different approaches are needed at different quitting stages.

Other studies focus on providing support based on quitting stage with the use of the TTM model. In a study by Aveyard, et al. TTM-based interventions were proven more successful than interventions that did not consider the different quitting stages of the TTM model [6]. The TTM model has also been used in several other research studies, to increase success rates, showing a relevance of acknowledging the need for different interventions at different stages for the highest efficacy [24][35][19][3][18].

Immediate Impact

When discussing motivation to quit smoking, and motivation to keep you going, we often found that when participants were faced with an ‘immediate impact’, this was highly motivational. Immediate impact is when someone is presented with “something” that affects them directly in the foreseeable future, so it acts as a motivator. This “something” could be related to health or money, which were seen as the predominant motivators. For example in our study, students often saw their personal economic state as being directly impacted by their smoking habits. When they smoked they could feel their economic state being damaged, as they do not often have a high income. One participant stated: “*the economical aspect is something you can feel right now*”. The older participants did not see this as an immediate impact as they usually had enough money to comfortably cover their habit. An immediate impact in their case is generally health-related. Considering their many years of smoking, and advancing age, this placed them at a higher risk of smoking-related health problems.

In Morris's paper on "Motivating Change with Mobile: Seven Guidelines" [22], two of her guidelines is *Show people what they could lose* and *Remind people of who they want to be*. She also stresses the slippery slope of health consequences that will occur if the user does not change behaviour in the short and long-term. In our literature review, we did not encounter any research that focused on immediate impact, making it a relevant topic for future studies, since it came out so strongly as an issue in our findings.

Smoking Habits

Participants expressed different smoking habits: some smoke out of enjoyment, others smoke when stressed, some smoked inside, whilst others felt most comfortable smoking outside. There was discussion amongst participants as to which cigarette during the day was the most important and whether or not you should smoke in front of children. The point being that people's smoking habits and attitudes to smoking are very different, which should be taken into consideration when designing for smoking cessation. For example, by knowing a person's smoking pattern, you can intervene with relevant information/advice/distraction at an opportune moment.

A study by Chung, et al. tried to map the smoking landscape of South Korea in terms of demographics and smoking behaviour [12]. They conclude that in knowing these factors, appropriate anti-smoking measures can be set, and in return this can greatly reduce cigarette consumption. Smoking habits could also be gathered on a more personal level in order to reflect on a person's own smoking habits with the goal to improve one's health [34].

Personalised

Many participants did not feel motivated to quit as they regarded the many health issues associated with smoking as never becoming a problem for them - they felt that it happens to somebody else. A participant said she did not feel motivated when she saw pictures of tar-filled lungs: "... *It just doesn't have any effect when those black lungs come up on the screen, because we all think 'Well that isn't my lungs, so how can you say that?'*", illustrating that the picture of the lungs were not motivational as she did not equate the picture with her own lungs. This highlights a need to make content very personal, so it can be as directly relatable to the user as possible.

In a study review by Strecher [39], he compares computer-tailored smoking cessation materials with non-tailored material. In the majority of the cases, the tailored material had a significant impact compared to the non-tailored, and tailored material seemed to have the greatest impact on pre-contemplators (defined in the TTM model as people thinking about quitting). These studies collectively show that when content is tailored and personalised it has a potential for a much higher impact.

Adjustable

Everyone is different. Almost none of the participants had the same approach to smoking cessation, including both participants who were currently trying to quit and the ones who were merely contemplating. Some participants liked the idea of going 'cold turkey', whilst others wanted to try

and reduce smoking gradually, showing a difference in needs when trying to quit. At the end of the focus group sessions, when participants were presented with the QuitBuddy app and shown the built in "distraction" game within the app, a participant said: "... *I would need to be able to say 'I want WordFeud instead' and then just easily via a few steps be able to have WordFeud there.*" The participant did not like the game within the app and wanted the games she liked instead. Therefore, people's individual needs should be considered and designed for. Perhaps a potential app could be tailored for a small target audience or it could be flexible in order to cater to a much broader target audience.

The study review by Strecher [39], mentions the concept of tailoring as important, but does not distinguish the many facets of tailoring and does not take *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised* or *Adjustable* into consideration. We assert that there are many different facets to tailoring and each need to be considered when designing smoking cessation apps. We will expand on this point in the discussion section below.

Reminders

When discussing the participants phone usage it was apparent that their usage was often dependent on their context, for example when at home, the phone was not used as much as when they were out. The participants had a tendency to forget about certain apps they had installed, making reminders particularly important for users to return to the app. It is thereby important that a system reaches out to the user, instead of waiting for the user to visit the system. A system should notify a user to inform, remind and encourage them to engage and interact with it.

Fogg, et al. did a study on the use of texting to persuade health behaviour change, using them to remind and notify people in regard to specific health topics [16]. Roubroeks, et al. did a study on the forms that such notifications should take in order to achieve maximum efficacy [33]. Both studies remind us about the effectiveness of reaching out to people to get their attention. In a past study we encountered a positive response towards using notifications, which were considered particularly useful when sent at different times each day [9].

Self-Monitoring

When shown the QuitBuddy app the participants all liked the self-monitoring elements. These were: a smoke-free timer, the total amount of money the user had saved, and the amount of tar avoided, although it was hard to translate the last one into something that the user could relate to. A participant said: "*I think that the timer is good, but it is because I see the timer like somewhat a high score and as soon as you are having a cigarette, the number hits zero and you have to start all-over again.*" The participant saw the timer as a high score, which in turn motivated him to stay smoke-free. The money saved by participants was an "eye-opener" for them, which motivated them to reduce their smoking.

The act of self-monitoring was also perceived as motivational in our previous study [9] and could be seen as a persuasive technique to make people change behaviour

[15]. The concept is related to the research of Quantified Self in which the user becomes aware of various aspects of their self by counting things, such as steps taken during a day, using devices such as pedometers, and reflecting on them [11]. Self-monitoring can help people understand their own smoking habits to help them understand their addiction and to create strategies to cope with cravings [26]. Self-monitoring has also been used in other studies to detect when people are smoking automatically. In a study by Ali, et al. they used a device to measure respiration [4] and in a study by Scholl, et al. they created a lighter that tracks whenever the user is lighting a cigarette [34]. Neither study shows any results on how well this works. Through in our study, the participants were fond of the idea of having automatic Self-Monitoring, which indicates that studies like these may be relevant in using technologies to improve success rates.

Novelty

To gain the attention and interest of the user, people wish to be presented with new and surprising information. They want this delivered in creative ways in terms of content, technology and interaction; information that users already know is easily ignored. Smoking cessation campaigns often revolve around topics such as negative health impacts - this is information that smokers are already aware of and therefore ignore it. One participant said: *"It is fine that we have some smoking cessation campaigns, but it is not something you should apply in the application that smokers should use, because they already know it."* Designers and developers should think outside the box and avoid using traditional approaches and/or technology to increase a possible effect.

During our literature review we could not find any studies stressing the importance of this particular issue.

Meaningful Rewards

Meaningful Rewards were seen as a very big motivator, both in terms of motivating you to quit smoking, and also to keep you motivated whilst quitting. These rewards were a very individual thing. Examples offered included money "earned" from not smoking, physical objects that can be bought with that money, health improvements, personal achievements, motivational feedback and milestones. A participant stated: *"It was just so nice to be able to go to the bike store and say 'I am going to get a proper bike' which is what I got now."* This participant bought a bike with the money she had saved from not smoking and got immediate gratification from doing so. Another participant stressed that it is important that the reward is bigger than the satisfaction you get from smoking: *"My reward should be higher than how delicious I think it is to smoke..."* Rewards could be a successful strategy in any potential system design in order to motivate users during their quitting attempt.

Several studies have shown how financial rewards can be highly motivational. One study conducted with pregnant women who were given monetary incentives to stay off cigarettes showed that one-third had completely abstained from smoking by Week 12 of the study [37]. In another study conducted by Snuggs, et al. it was discovered that

the stimulation you obtain from rewards increased within a week of stopping smoking and after 4 weeks had increased even more [36].

Social Support

There was no consensus between participants in regards to needs for social support whilst quitting. Most said they would not use Facebook for social support, as the content on these sites was considered banal, while quitting smoking was perceived as a very important and personal subject which they did not want to share openly in such a forum. Also, by telling their friends and family about their quitting attempt it added unnecessary pressure and became a stressing factor, which in a worst case scenario would make them start smoking again. Some participants, however, gained help from the municipality in a social sense; here, they met with strangers every week in a quitting smoking counselling session, to discuss their problems alongside like-minded people, helping them keep on track. What we gathered from the focus groups was that social support might only work for some people and has the highest efficacy when conducted with strangers.

Many researchers have studied different social media sites in accordance to their efficacy within smoking cessation [43][44][23][27]. Ploderer, et al. [25] found that people at different stages take on leadership to support others in Facebook groups and that the kind of support is relative to their stage of change. We could not find evidence of the success of using social platforms such as Facebook during their smoking cessations.

Solo Struggle

In contrast to adding a social aspect, some of our participants felt comfortable without social support. One participant said: *"Because others cannot fight for you"*, meaning it is a solo struggle. Another participant also explained: *"There is nothing they can say that influences me. It is only my own expectations that influences me"*. In this case, adding a social aspect could make them dishonest due to embarrassment, which would render social support useless. By making it a personal struggle, this motivates smokers to stay abstinent. One participant said: *"Okay, now I have been smoke-free for 4 days by myself"*, making it a personal reward to be able to do it alone without help.

This aspect of solo struggle was not addressed in any of the literature we reviewed but the importance of this particular issue was evident in our findings from focus group discussions.

Competition

Competition was discussed in almost all focus groups. Competition can be against one another or against yourself. Participants perceived this as highly motivational. One participant explained: *"But when you think that you want to have a cigarette and when you think 'no I will take a look at my score, making sure that I do not break it'. It is like a game, where you always gain new levels, and when you take a cigarette you lose levels. Then it is like 'Ah crap'... I want to win this competition against others and for how long can I keep off the smokes compared to others?"* Interestingly there was consensus

amongst the male participants that competition would be motivational whereas most females did not find this motivational.

In a study by Cummings, et al. [13] smokers were placed in a worksite Stop-Smoking Contest in which cash prizes were awarded for quitting smoking. The study showed that one-third of participants managed to stay abstinent after 3 months, proving that a competition could be highly motivational. Arguably, the incentive of a cash reward might have played a large role in terms of the outcome of this study.

Design Workshop Sketches

The 12 issues were presented to the participants during the design workshops, to be considered when drawing sketches for technology that could potentially support them. In the design workshops, 15 ideas were identified. The produced designs were highly diverse, addressing different opportunities, challenges and requirements that surround people at different stages. Most ideas involved the use of mobile phones, either as the main tool or in collaboration with other technologies, one of which involved the use of a Self-Monitoring wristband. This was mainly due to the easy accessibility of their smartphones, being close to them in most situations. After reviewing these ideas, we chose to focus on three that we found to be particularly interesting in light of our research experience.

Timeline and Progress Bar

One of the design ideas is to have timelines or progress bars so the user is aware of their personal smoking situation. The main focus of the timeline is to visualise and project on the losses or gains from continuing or discontinuing their current smoking habits: *“I want the system to say that you could have had all this now, making me think about my habits.”*

The content in this system involves two main themes: health and economy - previously referred to as the biggest motivators. One design showed a graphical presentation of how your lungs appear, based on the amount of cigarettes consumed for the last week or month. By having data and representations, based on personal habits, it becomes more pertinent to the user. Such a system would include user input, such as personal interests, goals, motivators, cigarette brand and amount of cigarettes smoked per day, for the system to give personal feedback. The participants expressed that the system should also give creative notifications.

Wristband

The following concept originated from a participant studying medicine. In this design, the user would wear a wristband that measures their pulse. By knowing the pulse rate, you are able to detect when a person smokes, as smoking causes an immediate elevation of pulse rate. The wristband would be connected to a smartphone, where the user can access to all of their data and be able to compare with old data sets. The main focus of the concept is automatic Self-Monitoring of smoking behaviours, which was regarded as important to the participants, as they agreed that there is a high risk of users not manually typing all the data. By having automatic measurements, it is

possible to gather precise data, making it more valuable and thereby increase the potential effectiveness of the system.

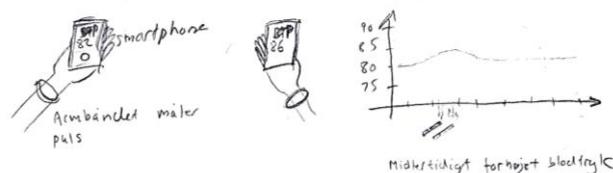


Figure 1. Wristband sketch as made by one of the participants.

Interactive Cigarette Package

Another design idea created during the workshop is to make an interactive cigarette package. It was something that they had not seen before, which gave them a sense of surprise and originality that they liked. The concept involves having a box with an interactive screen, showing information on the amount of cigarettes left in the package and giving feedback on the implications of smoking this number of cigarettes. The idea was inspired by the kind of anti-smoking information that can already be seen on cigarette packages, covering the general risks of smoking. The participants stated the importance of being able to personalise the system to their needs, in order for it to be highly motivational.

DESIGNING SMOKING CESSATION TECHNOLOGY

Based on the outcomes from the focus groups, the design workshops, our deeper understanding of smoking cessation issues gained from previous related research and our review of relevant literature, we have designed an exemplar prototype app. The design process involved a brainstorm session followed by iterative design sketching by the research team to develop a design that included what we regarded as the most interesting issues and suggestions from the design workshop participants.

Preliminary Design Suggestion

This preliminary design refines the idea of having a progress bar or timeline, highlighting aspects of both smoking and quitting. The design is intended as a mobile app, with two main pages (Figure 2). The first page is concerned with the user's health (heart icon). The second looks at the economic perspective, in respect to items or experiences (money icon). These topics were chosen as our user group regarded them as the most important aspects that motivate people to quit.

The system presents a progress bar (using pictures and images) showing immediate threats or benefits, depending on whether the user is preparing to quit or is currently trying to quit. In both aspects, the user is able to swipe sideways in either direction to gain an insight on immediate threats or benefits they have lost or gained, according to their quitting stage. By having these progress bars on health and economy, it is possible to see multiple milestones, maintaining ongoing interest in using the system. The design offers a button that gives the user the option of quitting, “Quit Smoking” in green, or inputting a potential relapse, “Relapse” in red, in order for the system

to supply the user with Self-Monitoring information in respect to their current situation.

On the health screen (see Figure 2a), the user is presented with different health topics. These topics could be immediate health issues, such as decreasing lung capacity, increasing blood pressure or risk of developing cancer. Showing smokers these threats tailored specifically to them, according to participants, is an effective approach towards reminding them of the damage caused by smoking, which is likely to encourage them to give up smoking. If a user is currently trying to become smoke-free, the system will present possible gains to them. This approach is supported by Professor Ron Borland from Quit Victoria, who has previously conducted research in this area and found that negative or shock messages can be a useful tool to make people decide to quit in the first place, while positive benefits become important when attempting to stay smoke-free [Borland, personal communication]. If the user is interested in getting more information about the health issue in question, the system can redirect the user to a page with a more in-depth explanation.

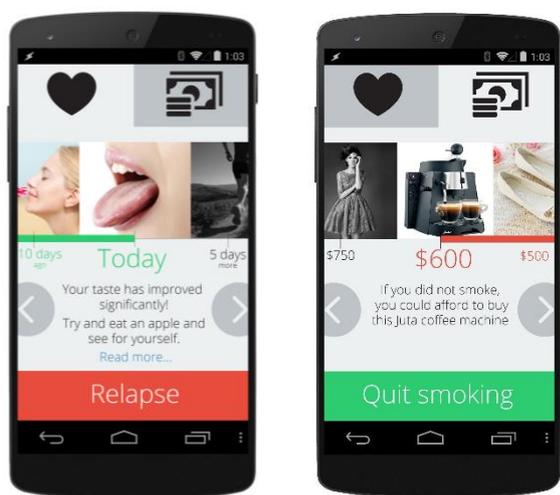


Figure 2. Preliminary design suggestion with focus on a) health (left) and b) economy (right).

The economy screen (Figure 2b) shows different items or experiences, that the user could purchase if they had not spent that money on cigarettes or will be able to purchase by quitting. By showing the user a certain vacation or a coffee machine they can or could have purchased instead of smoking, it potentially motivates them towards quitting. These are things that the user of the system has input as important to them, and therefore has a greater impact on making them realise what they have lost by smoking or what they have gained by quitting.

An important consideration with the content presented to the user is that it is based on personal preferences. In the introduction to the application, the user completes a set-up process, in which personal data is gathered, for the system to be able to provide a personalised output. According to our participants, this is an engaging process, as the system focuses on them and makes the content relevant. The data the system gathers, includes weight, height, age, amount of years smoking, amount of cigarettes smoked each day,

price and volume of the preferred package of cigarettes and personal interests and/or goals. By applying this personal information the system can cater to the needs of the user.

Another aspect of our design is that the system uses different forms of reminders. This is to both inform the user of their current status and surprise them. By having different forms and content for reminders, it increases the user's interest, according to our participants. Also, by notifying users of what they have gained or lost, they might use the application to obtain more information. This aligns with our knowledge about participants' use of smartphones, where notifications are essential in order for them to use apps.

DISCUSSION

In this paper, we report on ongoing work that explores issues to be considered when designing technology for smoking cessation. Our contribution is both in our user-centered design approach, and in the new knowledge gained on what is important to actual smokers when trying to quit. In our approach, we made use of focus groups and design workshops to produce qualitative data on how potential users of behaviour change technology perceive the role that technology might play in helping them to quit smoking.

In reflecting on our experiences in doing this study, we found that the topic of people's smoking habits was very sensitive, making it difficult to investigate and gain the required knowledge. An alternative approach could therefore have been to use cultural probes [17] to capture valuable data from participants while in the context of smoking. This has proven useful in similar sensitive situations [42]. It may have given participants a better opportunity to express themselves in regards to their own smoking cessation issues in a more private way.

Tailoring

The study indicates that smoking cessation is a personal topic with different needs. Throughout the literature within this domain, others have shown the element of tailoring important [39]. The phrase has different meanings, depending on the perspective of each study. We suggest that the word 'tailoring' is not enough and is a more finely grained concept. In this study we discovered multiple facets worth considering when designing and tailoring technology, these being personalised content, adjustable components of the system, information specific to a person's quitting stage and smoking habits and messages that have immediate impact for that person.

The Design Suggestion

Throughout the user-centered involvement, the social aspect of quitting was discussed; participants believed the social aspect is less important, primarily as smoking is often considered a personal struggle. However, when considering the progress bar idea, a social aspect was discovered, which could be utilized in a beneficial and motivational way. The suggestion considers the possibility and opportunity for people to quit together as a group. The rationale is that, if making a group effort, the task becomes easier, rather than attempting to quit alone. The system could offer the option to create a group of friends that wish

to reach goals together, whether that includes health benefits, such as increased fitness, or experiences they can do together, such as eating out.

The social aspect of quitting has been implemented throughout multiple research studies, illustrating different results [26][27]. Our study suggests that in order for a social interaction to become helpful, people need to meet up physically, thus presenting a technological limitation. Within the study, two participants from a quitting course were included. They stated that being able to physically meet up with other people, who were also trying to quit, was beneficial and helpful. This leaves the social aspect of quitting to be conducted in a clinical setting, in order for this to have an impact.

There was an interesting discussion point about the self-monitoring of information. During the focus group and design workshops, we encountered the necessity of having an automated system of self-monitoring. The participants noted it could be difficult to manually enter data, given that there are social situations such as parties, which make this task awkward. By having situations where the system might not be used, the user might forget to give the system the necessary data in order for it to provide precise and relevant feedback.

The current design suggestion makes use of estimates: considering daily intakes of cigarettes, prices, and static knowledge of weight. By having these estimates and static data, the system is unaware of any changes, rendering the data imprecise. Participants suggested using wristbands to track information on health, stating the importance of having personal data, and telling the user of their current health state.

In a design workshop, one participant criticized the use of a progress bar, in regard to the material gains from quitting. He explained that by having these goals, it can be perceived as the amount of time needed for him to begin smoking again. It was suggested to turn the idea upside down; instead of focusing on the time it takes to get an expensive object (such as a car), you buy it upfront. This adds another motivational factor towards not consuming cigarettes, due to increased economic pressure. During the study, it was stated that for a reward to have a significant impact, it needed to be equal or more enjoyable than having a cigarette. This could become possible by paying for an expensive item at the beginning of the quitting stage.

Reminding People of Cigarettes

An interesting discussion point discovered is that this technology should not remind people of cigarettes, as it reminds them and creates cravings: *“It must not remind people of having a smoke. Enough is doing that already. If I had an app that kept giving me messages, I would just think ‘I could really use a cigarette right now’”* This raises an interesting issue, when designing technology for this context: How can we create a technology to help people quit, without reminding them about cigarettes?

LIMITATIONS

This study is limited due to the amount of participants involved; some of whom have not tried to quit before and/or do not want to quit in the foreseeable future. Due to missing experience on how it is to quit smoking, it can be difficult for the participants to offer knowledge on what is helpful.

In the study, a prize pool was applied to give participants an incentive to be part of the study; this, in turn, could have an impact upon the data quality, due to a response bias.

During the design workshops, half of the people had already been involved in the focus groups. It is possible that, by adding new participants, alternative outcomes could have occurred.

CONCLUSION

In the study we discovered 12 important issues that need to be considered when designing technology for smoking cessation: *Quitting Stage, Immediate Impact, Smoking Habits, Personalised, Adjustable, Reminders, Self-Monitoring, Novelty, Meaningful Rewards, Social Support, Solo Struggle and Competition*. By doing a user-centered approach we have gained new knowledge and supported previous research that has been conducted within this domain, and we have managed to develop an exemplar design prototype that takes its roots in the participants' needs, making it truly user-centered.

This paper stresses a difference in perspective, on how technology can be applied for smoking cessation. Further understanding is needed in all aspects that surround the domain, in order to design and develop useful technology that supports user needs. The work within this paper takes an important step to a better understanding of smoking and quitting, by focusing from a user perspective, in which we hope to encourage further work in this and other health behaviour change areas.

FUTURE WORK

This study is limited in regards to the amount of participants, which covers a miniscule percentage of smokers. Further study is required, including a larger participant pool, in order to confirm the findings from this study.

The smoking cessation issues require evaluation in future research through a practical longitudinal implementation of a system that can be evaluated in the field. By doing so, we will be able to refine the issues and thereby potentially give people the support they feel they need.

Also, the study limits itself to focus only on mobile devices, such as smartphones. It would be interesting to implement the issues through other technologies, such as tablets or PC's for further understanding on how they can be applied.

We suggest that the issues also can be applied in different ways. A future study could be done that develops other design suggestions than the one we propose.

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STUDY FINDINGS

In this chapter, we present all the findings gathered from the focus groups and design workshops. We firstly present findings from the focus groups, including overall and specific issues, which formed the basis for our design workshops. From the design workshop, different ideas, concepts and sketches by the participants will be presented. We have written this chapter so that the details of our user participation sessions and outcomes are well-documented.

FOCUS GROUP FINDINGS

During the first round of participant involvement, we discovered that people are very different when discussing reasons for smoking and reasons for quitting. The study shows that the most common reason for smoking is enjoyment, avoiding stress, to have a break, habit/addiction, whilst drinking alcohol and socialising with others.

When discussing reasons for quitting, the study shows that the topics having the biggest influence on them are health and money. This is due to the fact that these are areas that often affect them directly, but at different times in their lives. An example is when people are young, economy has a high influence on their habits, due to overall low income.

The study indicates that cravings from smoking differentiates between two different types: physical and psychological. According to the participants, they struggle between these types of cravings. One of the participants explained:

“Yeah, the physical craving will pass, but the mental is an issue.”

This is further supported by a story mentioning *the little voice*, referring to psychological cravings:

“I don’t think that the little voice that tells you to smoke, ever goes away. For example, the grandfather of one of my best friends was 92, he was at home and he was really really sick, so the family was waiting for him to die, basically. He haven’t been smoking for 30 years. The last thing he asked was to get a cigarette and a coffee.”

This illustrates that the physical craving may disappear, however the psychological craving will always linger, making it something to consider when designing smoking cessation technology.

On some occasions, participants expressed smoking as being a part of their personality, which is another consideration when designing for smoking cessation. We therefore learn that we are not only designing technology to change their behaviour, but also to alter their personality.

Smoking being part of people’s personality also reflects upon how they are perceived by others, as a participant explained showing a concern towards quitting:

“I have been smoking for so many years that it is sort of part of my personality and I think that is gonna change. What am I gonna do for pleasure? And what am I gonna do for breaks?”

Another finding worth mentioning, is the fact that the topic of smoking and smoking cessation is very personal and sensitive. The participants in the study felt patronised by the approach used in anti-smoking campaigns,

as the participants felt like they were being told off for smoking, almost like a teacher telling off a student. In some cases, the smokers might experience psychological reactance, due to this patronisation.

During the focus groups, we asked if the participants had tried a mobile application for smoking cessation while attempting to quit; interestingly enough, none of the involved even knew that such apps existed. An explanation to why this is, could be in connection with the limited selection of smoking cessation apps that Danish people have access to, in comparison to other countries, as accessibility to apps is often dependent on geographical location. For example, if you are searching for smoking cessation apps in Australia, this search would yield a much larger selection.

In order to introduce the participants to the concept of smoking cessation apps, a specific app was chosen and presented from the Google Play Store, named QuitBuddy. This app was chosen due to the large array of inbuilt functionalities, such as a timer to see how long you have remained smoke-free, how much money you have saved by not smoking, the ability to set up personal goals, and a game to keep your fingers and mind occupied whilst experiencing cravings.

Based on our thematic analysis of the focus groups, we discovered 12 issues. These issues are all topics that designers and developers should consider when trying to design and develop technology to support smoking cessation. It would be pertinent to note that these issues are based on the knowledge of smokers in different quitting stages, and not from literature within the field. Although, a lot of the issues are discussed in the literature in regards to technology and smoking cessation. These issues were later used during our design workshops with the participants to develop ideas and concepts on how technology could provide them with the right support.

During the design workshops, the users were presented with different terminologies of the issues, which is illustrated on figure 1. The words to the left are the ones which were presented to the participants, whilst the words to the right are the refined version of the issues that we later rewritten during the project through multiple iterations. When creating the list of findings, we wanted each of the issues to be worded so they were self-explanatory. This was not the case with the previous used words, as the participants had difficulty in separating some of the issues, in particular the ones regarding personal and individual needs. Throughout the design workshops, it was necessary to explain each of the issues in order to reach a shared understanding.

In the following section, each of the issues will be described in detail, including multiple quotes from the participants, to get a better understanding of the issue at hand. Some of the examples and quotes used in the section, can also be found in the research paper.

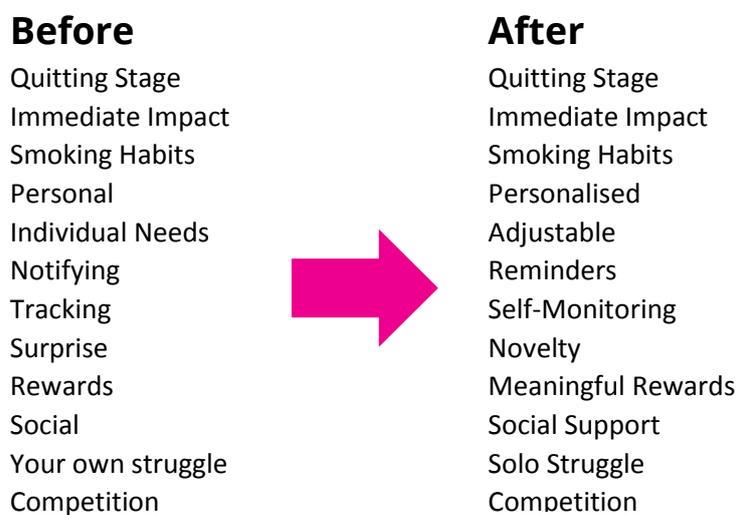


Figure 1: Changes in terminology

QUITTING STAGE

Throughout the focus group sessions, participants themselves were at different quitting stages. Some of the participants were not considering quitting, whilst others were contemplating or currently attempting to quit. This was further supported by the fact that some participants mentioned that you have to be mentally prepared in order to increase the chance of success during a quitting attempt, highlighting different stages within a smoking cessation context. By including smokers at different quitting stages, we are able to get a better understanding and multiple perspectives on this issue.

Whilst discussing anti-smoking campaigns, one participant stated:

“I think that it is fine that we have some campaigns that runs on the television, but it is not something you should place within an app that people who smokes should have.”

When reflecting on the Transtheoretical Model (TTM) [8], anti-smoking campaigns attempt to make people want to quit by using different approaches, covering stages such as *Precontemplation* and *Contemplation*. When developing technology for smoking cessation, it is important to consider all stages, in order to give the right support. People who have not started their quitting attempt yet need a different kind of support than those who are currently undergoing a quitting attempt, in order to provide maximum efficacy and the best possible support.

IMMEDIATE IMPACT

An interesting finding from the focus groups is that people need to be presented with a topic that is an immediate impact of their actions in regards to smoking. This impact could be either negative or positive, however it is important that the impact is within the foreseeable future.

This immediate impact can be based on several topics, such as economy or health. Different topics are of different significance to people, so they need to be carefully considered in order to have the highest efficacy. For example, Danish students rarely have the same level of wealth as an older generation, who has established a steady wage. Their lack of income dictates that their economic state can be presented as an immediate impact which can be solved by changing their smoking habits, i.e. by smoking less, they will have more money. One participant stated:

“The economical aspect is something you can feel right now.”

This illustrated that money is a significant motivation for this particular participant, as it is something that he or she can immediately feel the impact of.

In the case of the middle-aged generation, who has established a steady source of income, money can rarely be an immediate impact. Their steady wage allows them to maintain their smoking habit, without it playing a significant part on their economic position. At this point in their lives, the middle-aged generation are a more vulnerable position in regards to their health, where their years of smoking will begin to take its lasting toll. Therefore, their health is a perfect candidate as an immediate impact for this particular target audience. One participant stated:

“I was young, back then, so it will never happen to me! It will first happen when I am around the age of 50.”

When the participant was young, her potential health problems from smoking were too far in the future for her to contemplate or worry about. Now, however, that she has progressed through life, her health issues are slowly becoming a larger and more important motivator for her to quit smoking. However, this being said, it does not suggest that money cannot be an immediate impact for the middle-aged generation and vice versa.

SMOKING HABITS

During the focus groups, it was discussed how people smoked for various different reasons, such as the reduction of stress, enjoyment, taking a break, etc. There were also a myriad of opinions as to whether it was acceptable to smoke inside or outside (often because of the odour left behind by cigarette smoke). There were different opinions as to which cigarette during the day was the most important to the participants. Most of the participants did not consider some cigarettes to be more important than others, however if they had to choose, they preferred their morning cigarette as well as the ones consumed whilst have a break.

It was discovered that other people could influence as to whether the participants smoked or not. For instance, none of the participants wanted to smoke in the presence of children, as they wanted to portray themselves as good role models and did not want children to inhale the smoke left by cigarettes:

“I know it has negative health consequences so I don’t want to let them see me smoking and do something stupid. So that is the only thing that makes me not smoke.”

This is an occasion wherein a smoker can show how they are well aware of the negative aspects and consequences of smoking. The participant further elaborated with the following statement:

“It is something that gives you pleasure, but it has side effects. So the only thing you do is not to think about the side effects. So I don’t want to quit, but I know I have to.”

Having this kind of data for your target audience can help provide the right information at the right time, and provide the right content for the highest potential efficacy. For example, by knowing when people usually smoke, designers can create systems that learn these times and occasions to provide some type of support at an opportune moment.

One of the participants noted that in order for a quitting attempt to succeed, you need to replace smoking habits with our hobbies or activities:

“So it is like something in the app, where you write some of your routines to be analysed in order for it to try and supply with new things you could do... So it could be to do things in another order or another way to get out of your routines.”

PERSONALISED

When either providing content to users or deciding on a topic, a system should revolve around, it is important to consider the personal nature of this topic or content. During our focus groups, participants found it hard to be motivated by anti-smoking campaigns, as they were not directly relatable. One participant noted:

“It just doesn’t have any effect when those black lungs come up on the screen, because we all think ‘Well that isn’t my lungs, so how can you say that?’”

When this participant was presented with an image of tar-filled lungs, she did not find this motivating to reduce her smoking habits, as the lungs depicted in the illustration were not her lungs.

ADJUSTABLE

In our focus groups, participants mentioned different methods that helped or would help support them. Whereas some participants tried the ‘cold-turkey’ absolute quitting method, others tried to gradually reduce the amount of cigarettes they consumed with the intention of quitting completely. It was also varied as to what kind of support someone wanted and how they would like to receive this support.

One participant, during our focus groups, noted the following when presented with a game within the QuitBuddy app:

“I would need to be able to say ‘I want WordFeud instead’ and then just easily via a few steps be able to have WordFeud there.”

The participant did not like the game available within the app, and wanted to choose another game instead. She even expressed the possibility of the app being adjustable so that you are able to add a game that you like, instead of the game that the developers have chosen for you.

REMINDERS

The study highlights that reminding users is an important tool to support, making the system come to the user and not the user coming to the system. The purpose of these reminders is to inform and encourage the user to engage and interact with the system on a consistent and regular basis. When discussing mobile applications, the participants stated that they forget about what they had installed after a few days, which is why reminders can be useful to nudge them to interact and use the system more often.

In terms of reminders on mobile devices, it is important to consider how these reminders may be perceived by the user, in regards to, for example, the amount of reminders they receive (which can become annoying and irritating for the user if they arrive rapidly and too often). Additionally, this can also make the user overlook the reminders if they are irritated with the fact that they have been swarmed with reminders and notifications. Therefore, the quality of the notification is crucial to consider for it to have a meaningful impact on the user, create interest, and avoid the participant becoming disinterested due to an oversupply of reminders and notifications.

One of the participants suggested conducting small experiments in these reminders, such as ‘try to eat an apple and rate how it tastes’, and then offer the same reminder and conduct the same experiment one week later. This is both surprising and positive, which can be motivating during a quitting attempt, making the user both aware of their own progress and the benefits (e.g. higher sense of taste) from quitting.

Reminding the user also becomes an important aspect when considering the participants phone usage. When they are away from their home environment, their phone is within relatively close range to them, and is typically located in a place so that it is easily accessible, such as a person’s pocket. This tendency changes when a participant is at home, due to the fact that they either want to relax (because the phone can become a stress factor in their lives) or because the phone becomes replaced with a computer, tablet, or other form of technology at home. This means that the phone is often located outside of arms reach, meaning that reminders are more likely to be ignored, until the participant has to use the phone for a particular purpose.

SELF-MONITORING

When the participants were presented with the smoking cessation app, QuitBuddy, most of them were fond of the self-monitoring elements such as the time that they have been smoke-free, and the money saved/earned from not smoking. In regards to the timer, multiple participants stated that this element was perceived as a personal high score, and as the number increased, it became more and more motivational.

“I think that the timer is good, but it is because I see the timer like somewhat a high score and as soon as you are having a cigarette, the number hits zero and you have to start all-over again.”

The participant, in this example, did not want to ‘lose’ their high score by consuming a cigarette, thereby having to start the timer all over again, making it effective as a means to smoking fewer cigarettes.

One participant noted that in order for self-monitoring to be useful for him, the app has to be accurate by gathering actual data automatically. Rather than being provided with a general estimate of how many cigarettes that he had avoided, and a general estimate of how much money he had saved, he wants to know the exact figures in order to reflect and be able to act upon it accordingly.

When discussing the other self-monitoring elements of the QuitBuddy application, such as how many chemicals and the amount of tar that had been avoided, one participant stated:

“I don’t know anything about the chemicals and how damaging they are. So the number does not mean anything to me.”

This excerpt highlights how in order for the self-monitoring data to be useful to the user, it has to be understandable, and something that they can relate to. In that regard, an awareness of the amount of chemicals, carcinogens, and tar that has been avoided becomes meaningless information to the user unless explained to them. They choose to ignore this particular information because they cannot directly correlate the statistics provided to their own personal self; they cannot fathom themselves in such a situation, therefore they ignore the thought and the possibility of it occurring. Furthermore, due to the constant bombardment of this type of information from smoking cessation campaigns, the user becomes numb to this type of information - it does not faze or shock them in the same sense that it would to a non-smoker.

NOVELTY

To get the attention and interest of the user, it is important to present new and surprising information, technology and ways of interaction. This is due to the fact that information and technology that they already know easily becomes ignored. In the instance of smoking cessation/anti-smoking campaigns, these campaigns often revolve around a certain set of topics, such as the negative health effects of smoking - knowledge that smokers and non-smokers are already well aware of. Therefore, this information is quickly ignored.

It was even expressed that this sort of information should not be used in a system that addresses people wanting to quit:

“It is fine that we have some smoking cessation campaigns, but it is not something you should apply in an application that smokers should use, because they already know it.”

The novelty element also refers to the information given during an actual quitting attempt, such as letting the user know how many days they had been smoke-free, which might come as a pleasant and shocking surprise to some people. One participant stated that when information was not obvious or trivial, it becomes more interesting and, in return, keeps you motivated:

“It should be something that captures your attention, so that you say: ‘Okay, so that is the reason’. I think that you need to be untraditional.”

One example of untraditional information was when one participant was surprised and unaware of the fact that taste buds improve significantly after only a few days of being cigarette free.

The participants in the study suggested multiple ways of creating novelty elements, both in terms of information, technology and ways of interacting. This included, but was not limited to: receiving playful facts, reflective questions, the use of humour or alternative approaches, like conducting mini-experiments such as eating an apple while you smoked and then eating one again a week later to gain a sense of how much your taste buds have improved in that time.

MEANINGFUL REWARDS

One of the biggest motivators when trying to quit was what we have called Meaningful Rewards. Of course, there are different types of awards and the rewards desired by one person can be completely meaningless to someone else. An example is money 'earned' from not smoking, physical objects such as cars that can be bought with the aforementioned money, health improvements, personal achievements, motivational feedback and milestones. Rewards might not motivate you to quit smoking, however it can be a type of support and motivation whilst you're in the midst of your quitting attempt.

The participants stated that by establishing or receiving rewards for themselves, the act of quitting would become a more positive and enjoyable task. It is pertinent to note that in order for these rewards to have a significant and meaningful impact, they must be of a high enough value; preferably, it must be of an equal or higher value compared to the enjoyment or perceived benefit gained from smoking. Therefore, the value of the reward outweighs the benefits of smoking:

"My reward should be higher than how delicious I think it is to smoke."

One participant explained the victory of being able to afford and purchase an expensive bike from the money gained from her quitting attempt:

"It was just so nice to be able to go to the bike store and say 'I am going to get a proper bike' which is what I got now."

In addition to this, a participant explained how much she had saved by smoking, by converting the amount to physical objects, such as seven shirts and two pairs of shoes - which had a much more elevated impact on her perception of what she had achieved.

An issue regarding rewards is how it should be transferred into the realms of technology. One of the participants stated the importance of having physical money that you manually put into a jar, each time saving money:

"You can in some way feel the progress in a different way. It is not like when you see the numbers on your account, it doesn't have the same effect."

Multiple attendees explained the importance of being able to move money manually, as it was a victory in itself to be able to take that money and add it to their savings. Additionally, another participant explained the enjoyment of the sound that occurs when putting money into a jar. It is thereby necessary to investigate how to transfer this feeling to a technology in order to achieve the biggest impact.

SOCIAL SUPPORT

A discussion point in the focus group was the possibility of using social support when trying to quit smoking. It was stated by the participants that social media was not something that they believed would help them whilst they are trying to quit. They were getting annoyed by social media sites, such as Facebook, where they found most status updates trivial and unimportant. A participant explained quitting being a very personal topic:

"I did not tell anybody when I decided to quit smoking the last time before I was actively quitting for a longer period of time, due to people always asked 'Have you been smoking?' and 'How are you, now that you have quit?' and things like that, and that I do not want. I do not need people asking me, how I am doing."

The participant added that she would prefer to have an app private on her phone, rather than using social media sites such as Facebook. Often, the participants did not inform their family or friends about their attempt

at quitting, as this could add an extra layer of unnecessary pressure. Not only would you disappoint yourself if you relapsed, but you would also disappoint those closest to you, so there is a concern in telling others:

“You find yourself on public display when telling people that you have relapsed.”

Another participant added to this statement by saying it becomes a stress factor, rather than a motivational factor:

“Because you always has it in the back of your head that you have to take other people into account and they expect that you have quit and that you try your best to stay away from smoking.”

During one of the focus groups, the idea of having a mentor during your quitting attempt was raised and discussed - someone who advises you and helps you through your smoking cessation journey. A participant explained:

“I think support from friends and family would be important, but to have an actual mentor no, if that was a friend or a family member I would just get pissed off at them.”

From this, we can observe how social support from people that are close to you, e.g. friends and family, can become problematic, since it could be perceived as an annoyance, rather than being helpful and supportive.

The study shows that in order for social support to have an impact, it should be with strangers who are experiencing and who have experienced the same problems as yourself. According to some of the participants, who attend smoking cessation courses, it becomes supporting to not know the people and know that they still completely understand and empathise with your situation. The participants were fond of the idea of getting support from strangers, because strangers will not judge them if they were to relapse. One of the participants stated:

“Yes and there is no one to come and knock you on the head if you relapse. Of course they can but the possibility of meeting them again is unlikely.”

Furthermore, getting help from smokers, ex-smokers or people who are trying to quit was seen as more useful since they could more easily understand and relate to the issues that are associated with quitting, whereas family and friends, though meaning well, might not necessarily understand the scope of these issues.

In some occasions, participants could see potential benefits from using social support. An example of this is to hear other people's experiences in regards to quitting; one reason as to why this could be beneficial is that you are able to ask and talk to people about their quitting attempts, and thereby be able to somewhat predict what to expect during your own quitting attempt:

“That is what I am thinking about, regarding social media, where you get updates occasionally. It is not necessary every day. But for example if there have been 10 days or 15 days without smoking with a short update telling that ‘Now it has been 15 days without. It is a bit difficult, but it helps.’ Then you are aware that it is okay to feel that it is difficult after 15 days.”

The participant adds by saying that it helps to not feel alone when trying to quit smoking; to be able to hear how others are feeling whilst they are undertaking the same difficult, life-changing task as yourself.

According to the participants, they require physical connections in order for social support to have any impact. This means that an online connection might not be sufficient:

“We can have a coffee and have a discussion about it.”

This is further supported by the people who attend quitting courses, where the social discourse and discussion becomes a central part and is perceived as very helpful. By knowing this, social media might only be useful within a clinical setting.

SOLO STRUGGLE

Quitting smoking for some people can be a very sensitive and personal issue; they see it as their own, solo struggle:

“Because others cannot fight for you.”

The participant refers to quitting as a personal fight. This is supported by another participant:

“I do not feel like telling others that I am quitting. They have to discover it by themselves because then it does not become a focal point and I am trying to get my thoughts away from cigarettes.”

This relates to the issue of making quitting a social concept, where it is difficult to include others in a personal attempt to give up smoking. It can therefore be difficult to let other people help, due to the fact that they are not the ones who are quitting. When discussing solo struggle further, a participant explained:

“There is nothing they can say that influences me. It is only my own expectations that influences me.”

This illustrates that personal expectations have an impact on whether they succeed in quitting or have a relapse. The participant adds by saying:

“It should be like your own proudness that suffers, if you start smoking again.”

It thereby becomes a motivator to not disappoint yourself by beginning to smoke again. Furthermore, perceiving quitting as a personal struggle could potentially help the user to be more honest with themselves. However, they could be more dishonest in the case of a competition between peers. A participant explains:

“I think that it sometimes can be an advantage to make it a personal fight, because I think that you are more honest than you would have been by fighting against others....But it is taking the fight up against oneself and no others are involved in it. I think that it would give a boost, ‘Okay, now I have been smoke-free for 4 days by myself’.”

The participant states that this can be a motivating factor: that they are able to do it alone without any help from external sources.

COMPETITION

Competing against others or yourself, was perceived by the participants as highly motivational. A participant noted:

“But when you think that you want to have a cigarette and when you think ‘no I will take a look at my score, making sure that I do not break it’. It is like a game, where you always gain new levels, and when you take a cigarette you loose levels. Then it is like ‘ahh crap’ or something like that. I want to win this competition against others and for how long can I keep off the smokes compared to others?”

The study primarily suggests that this element is more appealing to men than women, by trying to become smoke-free first or finding the first person to relapse.

This also correlates to the phenomenon of betting against others where personal agreements are settled. One of the participants stated:

“I want to say that my motivation now to cut down or quit is to beat my big brother in a half marathon, so it is pure competition.”

This illustrates that having personal agreements or goals against others can help in keeping abstinent, due to the high level of motivation that arise this healthy display of competitiveness. An important consideration regarding competition is to have a consequence that the attendees can feel, if they begin smoking again:

“Because my boyfriend and 5 guys made exactly such an agreement about, if they relapsed after quitting, they should pay 1000 kr. So that they could feel it.”

According to the participants in the study, the element of competition has an inherent flaw, which is honesty. In this context, this refers to whether or not you have had a cigarette. One of the participants explained the flaw by referring to her boyfriend, who had previously tried to participate in a competition with his friends through quitting. In the scenario, none of the attendees were honest about whether they had been smoking, which ended with them all relapsing and beginning smoking again, not admitting to it, and waiting for someone to admit defeat.

DESIGN WORKSHOP FINDINGS

In this section, we will look at the findings gathered from the two conducted design workshops. The purpose of these was to give participants, who had previously been included in focus groups, the chance to work with the 12 issues that we found. By allowing the participants to work with the issues, we hoped to gain a better understanding of each, and gain a sense of whether they are perceived as relevant in the context of developing technology for smoking cessation.

SKETCHES

In the following section, we will describe 6 of the participants sketches, in which 3 can be found in the research paper. We will describe important considerations and discussion points and will describe which issues are involved in each sketch.

Wristband

The following concept was conceived by a participant who studied medicine, and the idea originated from his knowledge of his field of study. In this concept, the user of the system would wear a wristband that could measure the user's pulse. By measuring your pulse, you will be able to detect when you smoke, as smoking causes the pulse to instantly elevate. This wristband would then be connected to your smartphone, where all the data is presented to the user. An issue which with this idea, as pointed out by the participant, is the fact that many activities alter the rate of your pulse, such as walking up a flight of stairs, which can skew the results from the wristband. A sketch of this idea can be seen in figure 2.

Potentially with this setup, the self-monitoring element would be through measuring the amount of cigarettes the user smokes automatically. The issue of automatic and manually input of data was important to the participants, due to the small motivation to manually input data. Generally, the participants wanted interaction to be minimal.

Furthermore, by making this process automatic, it would be more accurate and precise in regards to the actual amount of cigarettes smoked. A participant raised the issue that if she smoked more than she wanted to, she would not input the data manually, due to the embarrassment and sense of failure. Therefore, the automatic collection of this data would ensure that you are not able to evade your actions. Another participant also

stated that if he had the required motivation to manually input all the necessary data into the app, then he was dedicated enough to quit, hence he did not need to use an app in the first instance.

The participant who drew the sketch elaborated that when you receive this kind of data, you would be able to reflect more on your own smoking habits, and the system might offer tips and advice that has been personalised and tailored to the user based on the data provided.

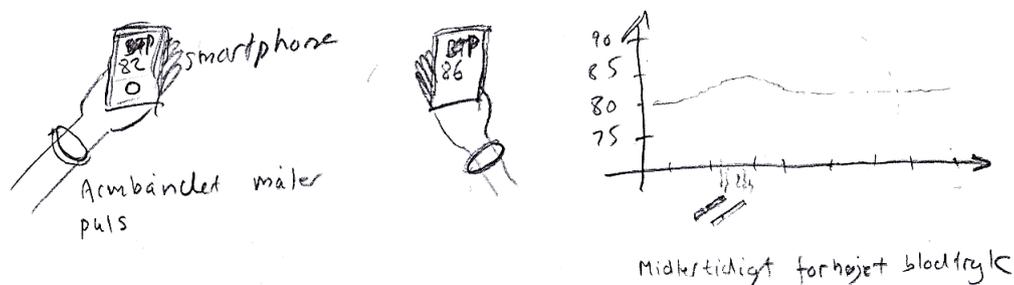


Figure 2: Wristband sketch

A participant in this sketching group also added other opportunities that could be done with the data measured and collected by the wristband. It could use the data to compare with earlier data sets. An example would be to consider someone who has been smoke-free for one year, where the system would compare the user's most current data with the data from one year ago. This would give them the ability to see and compare their improvements in regards to health, covering breath improvements (e.g. cardio ability) and details on being able to run farther and faster.

It was further suggested that the data could be used to compete against other people, be it with strangers, friends, or family members. Here, it would compare your data set with another person's data set in order to motivate you during your quitting attempt.

The same participant who developed this concept also asked himself the question of whether or not someone would actually wear such a peripheral device (a wristband in this scenario). He was nervous about how you would be perceived by others for wearing this, as well as the fact that the actual design of the wristband had to be designed so as to be aesthetically pleasing.

The concept surrounds multiple issues, such as *Self-monitoring*, *Personalised*, *Competition*, *Solo Struggle*, *Quitting Stage* and *Smoking Habits*.

Mapping your Smoking Habits

The idea is that the user, through their use of an application on their phone, will be able to gain an accurate insight into their smoking habits. The app would record when the user is smoking, and would collect contextual data in regards to each cigarette. By collecting geographical locations of where the user smokes, they will become more aware of this and perhaps draw some conclusions from these facts. A sketch of this idea can be seen in figure 3.

The system would be able to detect when you smoke, so the user would be able to observe whether they smoke more in the morning or in the evening. Further, if the system could obtain data from your personal calendar, it would be able to tell you in which contexts you predominantly smoke. For example, if your

calendar displays that you are currently socialising with friends, and the system recognises that you always smoke with friends, then the app could suggest to you that your friends could be a trigger for you to smoke.

All of the data would be presented in such a way that users would be able to easily interpret and reflect upon this data. Then a person could use this data before their first day of their quitting attempt. From this, the user would be able to pinpoint what their triggers were, before commencing their quitting attempt. By being aware of these triggers, the user might be able to look out for and alter certain habits to avoid triggers during their attempt. One participant noted how they did not know when, why and how much they smoked throughout the day:

“It’s easier to change something when you know what you are doing wrong.”

The concept surrounds multiple issues, such as *Quitting Stage, Immediate Impact, Smoking Habits, Personalised, Novelty* and *Self-monitoring*.

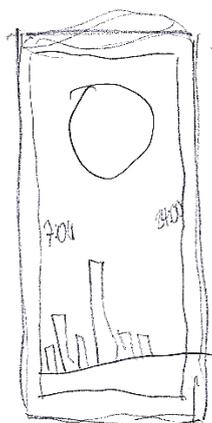


Figure 3: Mapping smoking habits

The War against Cigarettes

A unique concept gathered from the design workshops was one that the participants chose to label ‘The War against Cigarettes’. The idea would be that your smartphone would use the in-built GPS to access Google Maps, allowing you to view different ‘battlegrounds’ in the city you live in. The battlegrounds would be specific locations around the city. For each battleground, you would view data in regards to how many people have smoked there and how many people have resisted consuming a cigarette. The user would then input their own data whilst walking around the city, which, in return, would help the ‘war efforts’.

According to the participants, it might become de-motivational to see a particular battleground losing, when you are currently at that location. This would mean that more people have resulted to smoking here compared to those who have resisted. However, as mentioned earlier, people might not input the necessary data when they have smoked, due to a sense or feeling of shame and embarrassment, making the battlegrounds inadequate in terms of data.

Based upon all of the collected data from each user in the system, you would be able to draw and conclude pictures of geographical trigger zones, which could even suggest to users that they should avoid visiting these hotspot areas.

This concept surrounds and involves multiple issues, including *Quitting Stage, Smoking Habits, Self-Monitoring, Novelty, Social Support* and *Competition*.

Timeline and Progress Bar

This sketch idea focuses on having a representation of your progress in order to try and cut down, and possibly become smoke-free. The main idea suggests that people should be notified and informed of what they have lost, and/or what they are currently losing as a result of their current smoking habits. One participant explained this by having an illustration or image of your lungs, and then seeing how it would look like based upon the amount of cigarettes that you had smoked in the last week and/or last month. This representation of the state of your lungs could be based upon the amount of tar and chemicals in your lungs and according to the brand the user buys etc. - all facts that can be taken into consideration. When asked what the difference was between this idea and that of quitting campaigns, the participants responded:

“I think that, when it should be technological, then I have never seen that. Often you see commercials and stuff like that, but you have never had such technology at hand where you can control your own personal smoking habits.”

This states that making the concept personal is an important factor, which supports the findings from the focus group.

Another idea is that it could be things that you wish to buy, such as a specific piece of clothing, shoes, furniture or vacations, depending upon your own personal interests that are adjustable. It was discussed that it was important to vary the type of things that could have been purchased, including both expensive and inexpensive items. It would not be a good idea to present the user with a vacation that they could have had, right at the start of the quitting attempt. By only including expensive items in the system, it could potentially lead the user to feel overwhelmed, making them forget about quitting.

The participants stated that this would be an anti-rewarding system, which was seen as a motivational factor whilst preparing and getting ready to give up smoking, due to the fact that they become more aware of the consequences that originates from their smoking habits:

“I want the system to say that you could have had all this now, making me think about my habits.”

The participants also believed this idea would be helpful in order to reduce the amount of cigarettes, which could potentially lead them to quitting at a later stage in the process by presenting these items that you could have if you reduced or quit smoking.

The idea of what may be gained through not smoking could also be led and channeled into other ideas, such as making the user physically do something that makes them aware of the changes that happen within their own body. It could be something as simple as having the user smell a flower after having been smoke-free for one week, or it could be for the user to try and make food with a recipe that uses a lot of flavour. It is important that you can receive this information immediately, which means that it would not be too far in the future so as to be unforeseeable and de-motivational.

The concept of having these visualisations of progress could be supported by notifications and reminders, that ask the user whether or not they have been smoking, making it possible for the system to analyse this data and supply helpful feedback. This could be information on the amount of intake or money lost by smoking daily, in order to affect and leave an impact upon the user. An important factor is to keep continually engaging the user, by varying the type of content supplied by using different types of content, such as images, graphs, text messages, quizzes etc. By using the same type of information and notifications, the user might lose interest and become de-motivated.

The participants viewed automatic self-monitoring as important in order to gain data on the amount of smoking that has occurred. This is due to the fact that the participants believed they would end up forgetting

to enter the required data or that they were in a situation where they would not use it, such as a social situation with friends at a party. By automating this process, it helps create more reliable feedback which can, in return, offer more relevant feedback to the user.

When discussing the idea of utilising timelines and progress bars, it became clear that the focus should change accordingly to the user's quitting stage. To get people contemplating quitting, a focus of personal loss might be supportive. When a user is actively trying to give up smoking, the focus has to be on the benefits that the user gains from quitting. This could be many things, such as things that the user can now afford as a result of quitting, health improvements, or personal rewards from having remained abstinent.

The sketches illustrating this idea is found on figure 4. The image to the left highlights the progress bar, whilst the image on the right portrays the idea of using a timeline with multiple milestones.

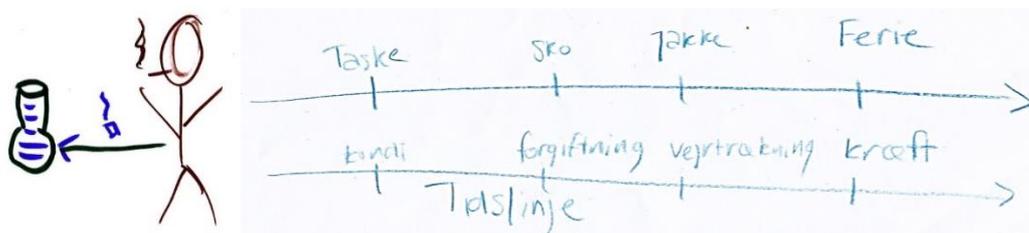


Figure 4: Timeline and progress bar

The idea was later supported in the second workshop wherein one participant had the idea of a reversed progress bar. Rather than focusing on the amount of time that you need to be smoke-free in order to achieve the things you want to buy, you buy it at the beginning. If you want to buy a special type of item, it might seem too far away in the future to be able to try and earn money to afford it. In order to feel motivated, the participant needed to feel an immediate impact of his actions. Therefore, by having the item that you want immediately, it helps to achieve an equal or higher satisfaction, than you otherwise would have received from continuing the habit of having a cigarette.

An important consideration, which was also stated during the focus groups, is that the prize has to be big in order to become worthwhile. By buying an expensive product immediately, such as a car, you need to obtain a loan, which takes years to pay back. The longer it takes you to pay back this item may help towards motivation in not smoking:

"So if I bought something quite expensive for myself, I would feel bad also that afterwards, using money on cigarettes, because that was kind of the agreement I made with myself, right?"

Further, once you have reached the point where you have paid off the money owed, it might not be perceived as worth it to start smoking again, due to the years that the person had been smoke free:

"Buying a Mustang would mean no cigarettes for many years and then after those years you may think: 'Okay, well I can start smoking again, but then again have been smoke-free for that many years, so do I actually want it?'"

The participant explained another problem. In terms of the progress bar: it will show you when you will have enough money for the items you want, so it incidentally could be seen as a timer for when they could start smoking again. If the participant were to purchase an XBOX gaming console, the participant would consider

smoking again as soon as they can afford it. It is thereby necessary to maintain constant and continual milestones in order to keep the participant motivated.

When asked whether the concept could include the aspect of social support, the participants came up with the idea of collaborating to save money, in order for them to be able to use this money for social activities. This could potentially help motivation by quitting together, due to a common reward or goal that they are all interested in achieving. As a couple, the participants thought it would be interesting to combine the amount of cigarettes smoked with each other, in order to get an idea of things that they could do, such as having a luxury brunch or going to the movies instead of smoking.

The concept surrounds multiple issues, such as *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised*, *Adjustable*, *Self-monitoring*, *Novelty*, *Solo Struggle*, *Social Support* and *Meaningful Reward*.

Random Content

Another concept raised was the idea of having an application that distracts the users from having a cigarette; this mainly focuses on the quitting stage involving people trying to maintain their abstinence from cigarettes. By using different content, such as short videoclips, engaging games, funny images etc., the app might be able to distract the user from consuming a cigarette. The participants referred to popular mobile games, such as Candy Crush², that were engaging and addictive, which potentially could lead them to forget about having a cigarette.

When discussing video clips, it was expressed that they need to be short. By knowing that a video clip is seven or ten minutes long, they have already lost interest, before watching to see what it offers. By having short video clips, it is possible to supply the user with multiple videos that each offers something different, creating a higher interest of what comes next. The videos could be based on the user's personal interest.

According to the participants, the element of novelty was perceived as an important consideration. This could be a factor that makes the system interesting, so the user becomes excited on what might come next, which further supports the concept of being distracted. If implementing the system, it is important to make it easily accessible. If you are having a craving, you want help quickly with as few clicks as possible. The system should thereby be faster and easier to access, compared to having a cigarette. The participants mentioned an idea of having a panic button on the phone, which directly opens the app, when needed:

“When cutting the amount of clicks down to a minimum, I think you increase the chance of the application being used significantly.”

This concept surrounds the issues of *Novelty*, *Solo Struggle* and *Quitting Stage*.

Interactive Cigarette Package

Another interesting idea that was brought up during the design workshops was to have an interactive cigarette package. It was received as a very interesting suggestion by the participants, as it was an innovative and unique type of technology that has never been seen before, thus creating the element of surprise. The suggestion involves having a screen on the outside of a cigarette package; one of the key functionalities, within the technology, is to inform the user as to how many cigarettes are left in the box, which is based upon weight.

By providing the user with personal information based upon their smoking habits, it was seen as having a bigger impact towards quitting. The idea refers to the information provided on normal cigarette packages, covering the risks involved through text or images. By making this content personal by considering the user, it becomes more difficult to ignore, thereby making it more likely to gain their attention.

² A mobile game available on platforms such as Android and iOS.

Additionally, the technology could involve multiple personal tools. The participants suggested having personal motivators of why they should quit smoking. This could both be to select from a pre-made list as well as the option to allow the user to add their own personal reasons, pictures and goals. It was suggested that these could involve performance regarding sports, health and money saved.

In addition to adding personal information, such as habits and motivators, it was noted by participants that they thought it was important to let the user decide on how they wish to quit. This could be through an immediate or slow approach, where the system adapts to the user by locking the package. This was seen as particularly useful if the user chose the immediate approach, as they would become more annoyed if the system kept locking the package when they wanted a cigarette, whilst the user is trying to reduce their cigarette intake.

The important feature of the technology is that the user creates the system based upon their desire of how they want to use it, allowing adjustability and adaption to their needs, whether this involves personal motivators, goals, approaches or language types in the form of politeness or aggressiveness. The participants did not consider a long setup phase problematic, as it was seen as motivational to create a system to revolve around your own needs. Further, the participants considered themselves used to experiencing these setup phases when creating a new system, making them willing and eager to take the necessary time in order for the system to understand and respond to their needs. It is crucial that the setup only occurs once, so that the user does not need to do this each time they open the system, which would make the user use it less or not at all.

A visual representation of the idea can be found on figure 5. The sketch to the left illustrates the box with the interactive screen in which a cigarette package can be placed. The image to the right highlights in more detail some of the functionalities that the interactive screen could include.

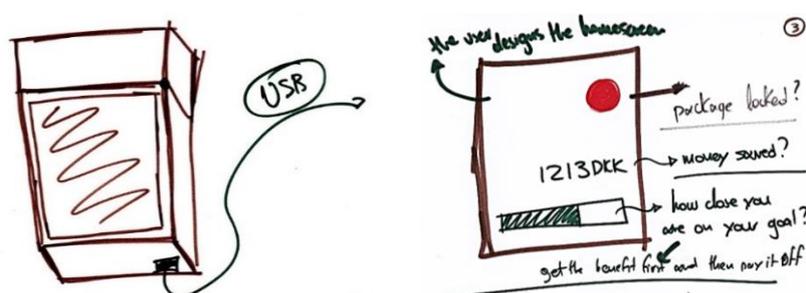


Figure 5: Interactive Cigarette Package

The sketch involves the issues: *Quitting Stage, Novelty, Immediate Impact, Personalised, Adjustable, Smoking Habits, Self-monitoring* and *Solo Struggle*.

OTHER FINDINGS

In the design workshops we encountered other interesting findings and observations in regards to creating technology in this context. One of these findings is different prioritisation of the 12 issues, which depends upon multiple factors. In designing sketch ideas, the participants began by considering their own quitting stage and what type of support they needed in order for them to either begin or maintain their smoking abstinence. This highlights that the prioritisation will be different according to the different stages of quitting, so it is not necessary to include them all.

An example is the idea of the progress bar, which tells the user what they lose by smoking, and which primarily focuses on preparing people to begin their quitting attempt, and includes different types of content as distractions that focus on keeping people away from cigarettes.

We suggest that considering the quitting stage, as well as considering and including users who define themselves in this stage, can be beneficial in creating technology to support people in their smoking cessation journey. Furthermore, through the inclusion of users, it may increase their chance of becoming smoke-free, due to their knowledge about the context as well as individual needs.

It was observed that a potential system should not remind the participant of smoking whilst they are undergoing a smoking cessation attempt. This is due to the struggle that are associated of quitting, where you want to smoke as soon as you hear or see anything that reminds you of it:

“It must not remind people of having a smoke. Enough is doing that already. If I had an app that kept giving me messages, I would just think ‘I could really use a cigarette right now’.”

This creates an interesting issue when developing technology. How can we create a technology to help people quit, without reminding them of cigarettes? A participant mentioned after the workshop concluded, that she found it quite difficult to talk about smoking in the earlier focus group, as it was at the beginning of her quitting attempt. She thought it was much easier to do this during the workshop, as she had been smoke-free for a longer period of time and found it was easier for her to discuss the topic.

In designing technology for smoking cessation, multiple participants chose to design a system that could be applied on a mobile phone. This is due to the easy accessibility; phones are kept close to their owner. Smartphones are considered a useful tool, due to the possibility of keeping it secret and being able to use it discreetly when having a craving. This supports findings from our previous study, that showed quitting being personal. The users in the study preferred having a system on their phone so that they could keep it to themselves, rather than involving and telling people about their attempt. Other technologies were also suggested, such as using Google Glasses or smart watches, giving new possibilities that have not been seen before, such as being able to give user-augmented feedback.

Throughout the workshops we reached a new understanding of the social reason for smoking. According to the participants, the social element of smoking is not a main reason, but a coherent part of smoking. This means that the social aspect is a side effect that comes from smoking and not why people smoke:

“You are not smoking because you want to be social. You go outside because you are not allowed to smoke inside and then you are kind of social.”

The participants considered it important to quit as a group, due to the increased motivation that appears, when you are not the only person. Quitting by yourself while friends or family smoke in front of you adds an extra layer of difficulty. In the design idea that considered the progress bar, it was suggested to have the option of creating a group to support each other by saving money together.

CONCLUSION

In this section we will summarise this project, in which the approach and outcome are covered. This will lead to a description of our contributions within the research of HCI and smoking cessation. Finally, we will take a look at future work that needs to be conducted in order to accomplish a fuller understanding of what can be considered helpful within smoking cessation.

PROJECT SUMMARY

This project has been an extension of our 9th semester project, which took place in Melbourne, Australia; there, we created a web app based on previous studies and theory, to help people trying to quit smoking. A multitude of interesting findings and observations were gathered from this project, which justified continued work within this field for the 10th semester.

In this study it was decided to use a user-centered design approach, with the aim to learn and adapt to smoker's needs and wishes, in order to cater to these in a manner that would help them on their path to becoming smoke-free. The study was conducted with 4 focus groups and 2 design workshops, with a total of 18 current smokers and ex-smokers. Focus groups allowed us to gain an in-depth understanding of smokers, their habits, and their predicament in regards to quitting. This approach resulted in a set of 12 issues, surmising what should be considered when designing technology for smoking cessation. These issues were presented to the participants during the design workshops; these participants then devised design ideas based upon these. We then took the issues and design ideas further, and created an exemplar low-fidelity prototype based on the knowledge gained through the involvement of participants.

RESEARCH CONTRIBUTION

We discovered 12 issues that we consider important when designing systems to support people trying to quit smoking. These issues were: *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised*, *Adjustable*, *Reminders*, *Self-Monitoring*, *Novelty*, *Meaningful Rewards*, *Social Support*, *Solo Struggle* and *Competition*. Several of these issues were further supported by other research and theory conducted in this field (see paper for more details).

However, we did observe 2 issues that have not yet been addressed in the literature, based on our review. The issues in question regard the need to consider *Novelty* and *Solo Struggle*. In order to gain the user's attention, it is necessary to create and instil a sense of novelty in technology, content, approach, and ways of interaction etc. This is especially true within this context as smokers are indoctrinated within current smoking cessation strategies, which means that smokers easily ignore them. By applying novelty within technology, it helps to keep the user interested and engaged, which potentially can lead to higher motivation towards staying cigarette free.

Throughout the study, we noticed the important of considering the Solo Struggle of quitting, as multiple participants stated that they preferred to quit by themselves, without receiving support from others. It was explained that by quitting alone, it becomes more motivational; therefore technology could be useful in supporting this aspect. The participants were reluctant towards social influences, as it added further stress to succeed; if they relapse, they are not only disappointing themselves, but they are also disappointing others.

The participants argued the importance of quitting by themselves by stressing that others could not quit for you. We see these as a contribution to the field as they can aid designers and developers to reflect on what is important when designing relevant systems, as these issues are derived from the needs, wants, and wishes of the users who are struggling to rid themselves of this habit.

We also found that the word 'tailoring' – which is often used within the HCI field – is a more finely grained concept with a multitude of facets in this context. These facets are: *Quitting Stage*, *Immediate Impact*, *Smoking Habits*, *Personalised*, and *Meaningful Rewards*. When considering whether to use tailoring to persuade people who are trying to quit smoking, these factors should be reflected upon in order to yield the highest efficacy.

By using a user-centered approach, we were able to design a low-fidelity prototype that is truly user-centered. The design presents the user with immediate impacts from two topics – health and money – as these were seen as predominant motivators to quit by the participants. From both topics, the user will be able to view what they have gained or lost by continuing to smoke, or by quitting. The system personalises itself based upon input from the user and present rewards. For example, within the money topic, the content is based on items that the user wishes to be able to afford and buy. The design suggestion differs from the design of the app that we created in the 9th semester, due to another project approach, which shows a need to better understand the users.

FUTURE WORK

In this Master's thesis, we have created a design exemplar for a mobile application that can be applied to support users during a smoking cessation. Further research is required to try and apply this suggestion in a practical setting, in order to evaluate whether users perceive this as useful whilst preparing to quit or trying to remain cigarette-free.

The study is limited by mainly focusing on smartphones. It could be interesting to apply the issues to other technologies, such as tablets or PCs. In the study it was suggested that the upcoming Google Glass technology by Google could be suitable for this context. Google Glass makes use of augmented reality, in which the user can be given information. An example could be to present the user with personal messages when the user is smoking. Giving these messages in the context might lead the user to reflect on their own habits and hopefully change and alter their behaviour.

We suggest that the issues and findings gathered in the study can be formed as the basis of alternative designs within this domain. Further work, which includes these findings, is needed in order to design and achieve technology that can fully support people within this context.

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APPENDICIES

APPENDIX A: REFLECTION

APPENDIX B: BIBLIOGRAPHY

APPENDIX C: CD APPENDICIES

APPENDIX A: REFLECTION

In this appendix we will reflect on the things that we have learned throughout the research study. This includes, but not limited to: experiences, involvement of participants, approaches and improvements.

RECRUITMENT

During our study we have encountered the difficulty in recruiting participants for a smoking cessation study, which previously studies have been investigating as a focus point [6]. There are multiple reasons for this difficulty, such as it being a sensitive subject for people, the timing of the recruitment period and the fact that they have to participate through multiple sessions. In regards to the timing of the recruitment period, it could have been interesting to do it after New Year's Eve, where people make New Year's resolutions, to see if this would have yielded a larger turnout.

RECRUITMENT WEBSITE

During the recruitment period, a website was designed in collaboration with another project group, who were doing a similar project. This was done in order to maximize visitor numbers by not having two conflicting recruitment websites online for similar studies. Also, by doing this as a joint effort we managed to cover more grounds by having a larger number of people working on the recruitment efforts.

The design of the recruitment website had high priority, as we wanted it to create interest for anyone who visited, hopefully leading the visitors to sign up for the study. We made use of a bootstrap website that continuously reveals more content as the user scrolls down the page. In applying this design, we made sure that the user would not be overburdened by having a lot to read, which in worst case scenario could make them lose interest. The user is only presented with the information relevant to them in order to make their decision. This includes a short introduction about the purpose of the studies, a short text describing both studies, the prizes they have a chance of winning for participating, our requirements for them in order for them to participate and finally contact and sign-up information. It would be interesting to see if another order of the content would have changed the users' perception of the studies, thereby enhancing their willingness to be part of it. We have been discussing whether or not the visitors should have been presented with the prize earlier on the website, as we assume this would be the biggest motivator for them to sign up. Image of the website can be seen below and on the next page (Figure 6 and 7).



Figure 6: Screenshot of the recruitment website



Figure 7: Screenshot of the recruitment website

THE PRIZES

The prize pool of the study have been discussed a lot, as these could have an impact on the data quality, due to a response bias. The participants might give information that they think we would like to hear, rather than expressing their actual opinion. Conversely, if the participants did not receive anything from spending time in the study, they may not want to take part in it.

Due to the prizes being financed by ourselves, we could not afford to give all the participants a prize, which is the reason why we chose to give the participants a chance of winning one of two gifts. It may be the case that more people would be willing to participate if they were guaranteed compensation. Another aspect that have been discussed is whether or not the prizes were of a high enough value, in order for people to be willing to participate in the study. In our part of the study, the participants have to spend a considerable amount of time in focus groups and answer an online survey, where potential participants might think it is not worth their time, because the amount of time used outweighs the value of the prize.

ONLINE ADVERTISEMENT

Throughout the period of recruiting participants, we used multiple approaches online to advertise and create awareness of the study. Our statistics from the website shows that 675 people have entered the site, in which 41 have shown an interest, since the launch.

SOCIAL MEDIA

Using social network sites, such as Facebook, have proven to have had the biggest impact in recruiting participants for our study. A Facebook group for the study was created, in which each member of the recruitment team made an entry on their own personal Facebook page to reach friends, who had the option to share it further, thus creating a snowball effect. Our data showed that most of the participants signed up after these post were published.

To make sure that our shared friends did not get four similar post on their news feed at the same time, we coordinated the timing so that they were published at different times and dates during the recruitment period. We also found the times of the day that was the best to post, in order for the study to get the most visibility, mainly being lunchtime and evenings.

Furthermore, we contacted different Facebook pages, online forums and organisations that had an interest within the domain of smoking cessation. We were granted access to make a post on some of the Facebook pages, while other organisations could not allow the advertisement of a student project, due to organisational restrictions. When publishing a post on a Facebook page we experienced a small problem in regards to the

visibility of these posts. Since these posts were not published by the respective owners of the pages, it was placed in another area named “Contributions by other people” making it less visible to the visitors of said page. In order to reduce the risk of it getting overlooked, we shortened the text to only have the most important information to get people's interest and redirecting them to the recruitment website.

DANISH HEALTH AND MEDICINES AUTHORITY

During the recruitment period we contacted the Danish Health and Medicines Authority, in regards to advertising on one of their websites for smoking cessation (stoplinien.dk). We were allowed to place a banner, which would be visible to the public for 30 days. The only requirement was, that we had to make it clearly visible that we did not have any ties or affiliations with the Danish Health & Medicines Authority in any way. The banner was visible on a landing page for their quitting forums. Unfortunately, because of this location, it had a high risk of being overlooked by the visitors of the website, due to the fact that it was located on a page that can be skipped completely. Our initial hope was to have the banner on the front page, as this would have given it more visibility.

The experience from this collaboration has taught us the difficulty of advertising within this health domain. This is due to the ethical and medical background within a study, such as this, that requires approval by a multitude of people, before any actions can be taken.

GOOGLE ADWORDS

We also made use of Google AdWords to advertise for the study and to get people interested in visiting the recruitment website. Special keywords were picked, as to when the advertisement should be shown, making it relevant for the user, the advertisement was for example when a user searched “Quitting smoking” on Google. The analytics of this campaign, showed that the advertisement were shown 9425 times, with 27 people actively clicking.

POSTERS AND BUSINESS CARDS

In the attempt to recruit as many participants as possible, we created posters. Each poster consisted of a short text to get people's interest, information about the prizes they had a chance of winning, a link and a QR-code, directing people to the website. We created 2 different posters with 3 different colour schemes for each. The posters were made in line with the website design, in order to create a clear link between the two. The reason for making multiple posters, with different colour schemes and pictures, was to make them diverse enough for people to not ignore them if they saw a poster for the study multiple times. Our hope was that the users would not think “I have seen that poster before” and then ignore it. The posters were placed at different faculties and canteens on the university campus, in order to reach as many students as possible. They were also hung up at different stores, Studenterhuset (a social meeting place for students), the library of Aalborg, health clinics etc. It is hard to determine the exact impact of these posters in regards to visitor numbers.

In a combination with the posters, we created business cards that we personally handed out to people and placed at locations close to the posters, so that people could take a card with them, after seeing the poster. The business card also made it possible for people to share it with their friends who might have been interested in participating. Both the posters and business cards can be seen on the next page (Figure 8)





Deltag i et spændende rygestopstudie!

Prøv en helt ny app, eller deltag i spændende workshops og få chancen for at vinde en biografbillet eller luksusbrunch for 2

Sidste tilmeldingsfrist d. 16. marts

Læs mere på: quitty.dk






quitty.dk

Overvejer du at kvitte smøgen?

Prøv en helt ny app, eller deltag i spændende designworkshops og vind en biografpakke eller luksusbrunch for to personer. Sidste tilmeldingsfrist: 16. marts 2014

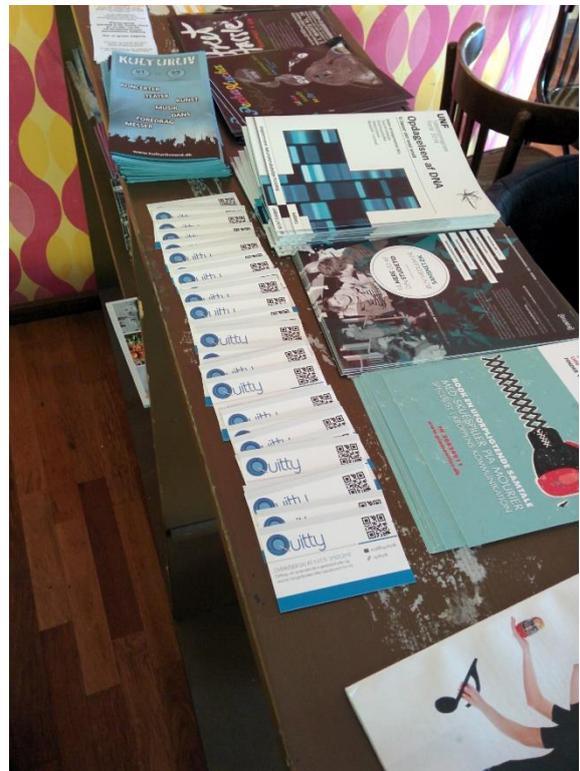


Figure 8: Pictures of two of the posters and business cards

SMOKING CESSATION COURSES

In the process of recruiting, we contacted Sundhedscenter Aalborg (Health Center Aalborg) who offers free courses for people that want to give up smoking. These courses were considered a good opportunity to try and recruit people that are currently trying to quit. A consent form had to be made for people to be handed out at the courses, explaining both of the studies including purpose and process. The consent form were made to make sure that the participant were aware of what was expected of them by signing up.

RECRUITING FOR TWO STUDIES

As previously mentioned, we chose to recruit participants through a combined advertisement for both projects. This have shown to be a difficult process, due to the different focuses of each study. While the main focus of the other study is to help people to quit smoking with a premade mobile application, we want to get an insight and understanding of the context in which we hope to discover a way where technology can play an important role. This presented a problem, where people who were not interested in quitting, which we considered perfect candidates for our study, got put off by the website because it signalled that we needed people wanting to quit.

The data from our recruitment website illustrates a higher interest for participating in the other study, which might be due to the different approach, where participants do not have to meet up in person and where they get to play around with an actual application.

Another difficulty, when recruiting for two different studies is sudden changes in focus, methods and process of each. This makes it difficult to recruit for the other study, due to missing insight on how they plan to conduct the user involvement. Better communication lines between the groups should have been established early on, to make sure that the website continuously represented both studies in a proper manner throughout the recruitment period.

FOCUS GROUP

In the study we used a focus group approach in order to get knowledge on smoking and on the experiences and difficulties when trying to quit. By using focus groups we have the possibility of creating a discussion on the subject and get further insight by the participants supporting each other's statements. Focus groups also help people open more up and state personal opinion when not being alone, due to the fact that other participants are in the same situation as themselves [7]. Figure 9 illustrates a focus group scenario.



Figure 9: Picture of a focus group scenario.

PREPARATION OF THE FOCUS GROUPS

The purpose of having a focus group is to create a space where the participants have the possibility to discuss the topics in question with each other. It is thereby important that we, make sure that we create this space and try to avoid it turning into an interview. The researchers should not be the centre of the session, which is the reason why open questions is used to make room for discussions on different topics. In order to avoid this we prepared a question guide, that could support us in regards to the topics we wanted covered. This turned out to be a very difficult process as we had to make sure that we covered all the topics, while at the same time being flexible enough to change direction if needed.

Often when arranging these sessions we used a direct approach, meaning that we would meet people in person or contact them personally to plan a date and time for the focus group in question. This was found to be very helpful, as we thought it would be harder to say no to someone in person then saying no to someone in an email. By being very direct we managed to get clear answers from people and thereby the setup of each focus groups was easier. When using emails to set up focus groups, we experienced that these was too indirect and easy to overlook, which meant that we occasionally experienced periods where we did not get any answers and made the setup of particular focus groups much more difficult.

PILOT FOCUS GROUP

In the study we did a combined pilot- and research session with people from the university whom were all smokers. The purpose of the session was both to get helpful insight on the domain of smoking while at the same time learn how to conduct and improve the focus group approach. By having these people as participants, we were able to get feedback by people who have real experience using this approach when conducting research.

The session was recorded on video, in order for our supervisor to get a first-hand insight on the approach of the session. This gave us the opportunity to get some very helpful feedback in regards to what worked well and where there was room for improvement. The feedback involved wording of questions, what should be noted down, eye contact and making sure that each and everyone in the session have said their personal opinion about the different subjects during the session. From the feedback we learned how we should be seated at the next session, in order to make sure that no one got overlooked. We also learned the importance of eye contact in situations where the session goes off-topic or people are being quiet during a session.

CONDUCTING FOCUS GROUPS

During each focus group we experienced that some of the techniques, we made use of, worked well. One being a word association task where participants were asked what the first thing they thought of when we said words like “Cigarettes” and “Quit smoking”. It helped us get immediate reaction and insight into the perspective of each of the participants. It was also an easy question that could help make the participants more chatty and comfortable with the situation.

Another approach, was to show screenshots of a mobile application. This proved to be a good change during the session, taking the focus away from the participants. Furthermore we discovered, when reviewing the recorded tape of the sessions, a relief when changing the subject to technology and smartphones, instead of smoking and smoking cessation.

The focus groups were all a mix of people in different quitting stages, with some people wanting to quit whilst others enjoyed smoking and wanted to continue. In involving people at different stages, interesting discussions on the topic aroused, based on their position and opinions on smoking. This approach made it difficult to make up questions as you had to consider the different stages and how to make the questions

applicable for every stage. The focus groups could have been grouped based on quitting stage. The result from this is hard to predict, but we imagine a more general consensus on the topics during the sessions.

Due to the unstructured nature of a focus group, it was difficult to go through the topics as written down beforehand, due to participants discussing these topics amongst themselves at different times during the focus groups. We therefore had to adapt to the situation and move the order of the questions around in order to foster a natural flowing conversation.

During the project, 4 focus groups were conducted involving different amounts of participants, due to sickness and last minute cancellations. This meant that we had to adapt to each situation in order to get the information we needed. The sessions involved 3, 4, 5 and 6 participants, which yielded different outcomes due to different circumstances, such as quitting stages, ages, gender and the like mindedness of some people. When conducting the focus group with 3 participants, we found that the session turned more into an interview than an actual focus group discussion. This meant that we had to steer the conversation more than we previously had to in order to collect the needed data. In another perspective, this session also gave the participants more time to reflect and express their personal opinion on the topic in question. In the focus group with 6 participants, we learned that this was too many participant for one sitting, due to time constraints in regards to hearing everyone's opinion on the different topics. With this many participants in one sitting, it also made it difficult to control the discussions, which sometimes made people go off-topic. At different times throughout the sessions participants started talking to each other in smaller groups making it hard to keep track of what was being said. Based on the lessons above, we believe that the most optimal amount of participants for an approach like this is 4 to 5 people.

THEMATIC ANALYSIS

When analysing the data, we made use of a physical affinity diagram, having print outs instead of using software. This approach might seem old fashioned, but we have found, that it helps us get an overview of the emerging themes. Furthermore, the approach helps to create a common understanding of each theme which can be discussed continuously as new understandings emerges. Another positive aspect of doing affinity diagrams with print outs, is that it is easy to move quotes and topics around, to get a better picture of each theme, making it a very iterative process. Figure 10 illustrates our working space, when using affinity diagramming for this project.



Figure 10: Picture of the thematic analysis.

When choosing to do affinity diagrams, we considered using software, rather than making it physically. Though, we quickly concluded that using software did not give us the same overview as having it all printed out, due to the limitations of the screen size and the loss of flexibility, making it difficult to get a complete overview.

DESIGN WORKSHOP

We conducted 2 design workshops, including half of our total participants that were involved in the focus groups. Do to design workshops being uncharted territory for us, we naturally gained new experiences. As taught from our previous user involvement, we had to be prepared to adapt, due to the unstructured nature of this kind of user involvement. It was not possible for us to predict the designs, making it difficult to know exactly what to ask beforehand. This meant that the approach became semi-structured, having a list of questions that could be applied at different stages of the session, when appropriate, while at the same time be open to new questions arising. An approach to solve this issue, could be to make a pilot session of the workshop, before conducting the actual workshops. By having a pilot session, we would have been able to get an insight on how much time we should spend on the different tasks and how users would act, when trying to design and discuss ideas for smoking cessation technology.

The design workshops helped in regards to get a better understanding of the context, by letting participants draw and discuss the issues surrounding smoking cessation. By having these sessions as part of the project we also reaffirmed the issues found from the focus groups, leading to a better understanding. Figure 11 shows pictures of a design workshop scenario.

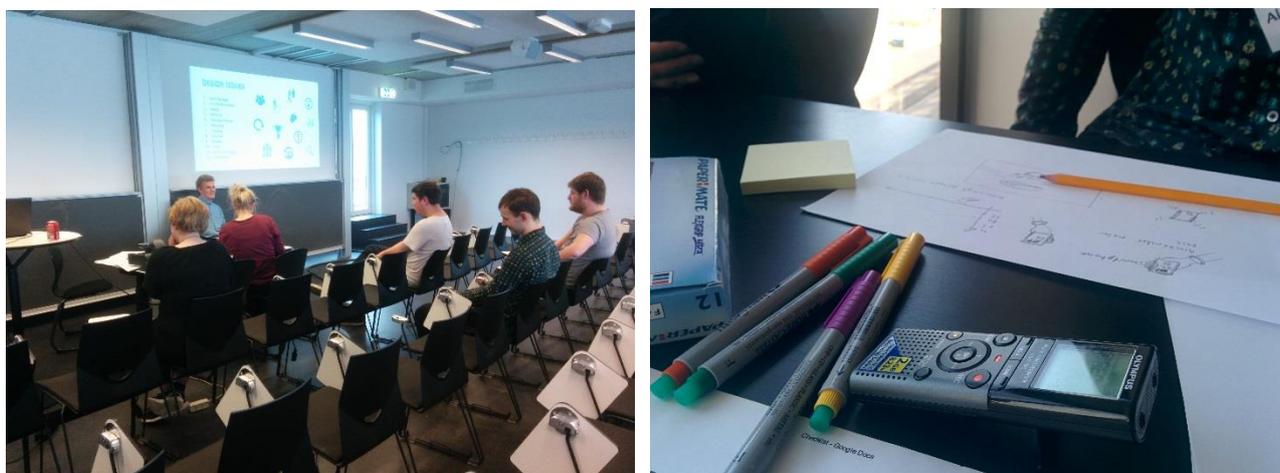


Figure 11: Pictures of a design workshop scenario.

MAKING IMPROVEMENTS

After having conducted the first design workshop we learned a lot that helped improve and shape the second workshop. This involved the warm-up task, the grouping of people, the structure and whether or not the participant should prioritise the different issues.

Warm-up Task

In the first workshop we made use of a brainstorm task, named “Day and Night”. The purpose of this task is to get people to think creatively for the sketching session. The rules of the task is to find opposite words to the

ones presented. This can lead to funny solutions, making the participants relax and prepare them to be creative.

Before the workshop, we expected the participants to discuss possible solutions with each other. When conducting the task, we discovered that each participant mentioned the first word from the top of their heads directly to us. This meant that they did not discuss with each other or try to come up with new words. The reasons for this may be found in the way that the participants chose to sit, where all the participants were looking at the researchers, instead of each other. This might be due to the fact that the design workshop was conducted in a class room. In order to create an environment for discussion, a solution for this could be to place all participants around a table. Another way to improve the task, could be a better introduction. In our introduction we did not mention that they should have a discussion or come up with multiple solutions, as we thought this was a given. A way to resolve this could be to try it with friends beforehand, to get an insight on the outcome.

Grouping People

Throughout the first design workshop, we chose to group people into two smaller groups, having 2 or 3 people in each. By having smaller groups, it became difficult to come up with multiple ideas, due to people agreeing on design solutions early in the process, which prevented them from generating more ideas. This was particularly prominent in the group that only had 2 participants, as they almost immediately found a solution that they both agreed on. It was important that we, as researchers, tried to provoke them to try and come up with more ideas.

Another way that could improve the groups, could be to put people at the same quitting stage together. This would strengthen the understanding of the important considerations for each quitting stage, as it may be difficult to design for another stage than the one you are currently at. The participants predominately designed according to their own quitting stage.

The Structure

The structure of the session was also changed, based on our experiences from the first design workshop. In the first session, the participants were given 20 minutes to come up with sketch ideas and discuss with each other. When conducting the workshop, we found out that 20 minutes were simply not enough time for them to familiarise themselves with the smoking cessation issues and draw sketches. We chose to extend this in the second workshop, giving the participants more time to work with the issues and come up with multiple ideas.

We found out that the discussion in the sketching part of the session covered most of the questions that were planned for the final part of the session. This meant that the discussion at the end, became more of a repetition of what has already been discussed. We decided that in order to improve the structure of the session, we would combine the final discussion and the sketching session altogether, making it a natural conversation and gathering impressions while designing. This also meant that the same amount of data was gathered in less of a timespan, making the session more time efficient.

Prioritising Issues

During the workshop, we presented a collaboration task with the participants, involving a list of each of the smoking cessation issues. The participants were then asked to discuss and prioritise these issues in accordance to importance. When conducting the task, we found multiple problems, such as the structure of the pre-made list that was presented and reasons for priorities. By using a list, the participants might have had difficulties in moving the issues around, because these were already presented in the form of a list, which makes it look like some issues were already prioritised higher. It was clear that because they were presented in the form of a list, this had an impact on how the participants prioritised them. When looking at the prioritising from the

workshop, the top priorities are the ones that are located at the top of the list. A way to change this outcome could be to have each of the issues on an equal level or floating around.

The prioritising of the issues were very different according to peoples own perception and quitting stage. When preparing to quit, some of the issues were considered more important, such as immediate impact and surprise. When currently trying to give up smoking, these were considered less important, and instead issues like reward came out on top. A way to resolve the issue, could be to make the participants make different prioritisation according to quitting stages or make it into an individual task.

CONDUCTING DESIGN WORKSHOP

In each of the design workshops, we made an introduction covering the goal of the session and to inform the participants on what was going to happen. The presentation also included the smoking cessation issues found from the focus groups to make sure that they were well-understood before the participant had to use them during the sketching part of the session. Some people might have difficulties drawing sketches because they have high expectations of themselves or think that others have high expectations. In an attempt to ease the minds of our participants we used childish drawings (see figure 12) and text to implicitly tell them that sketches did not have to be of a high standard to be considered useful.

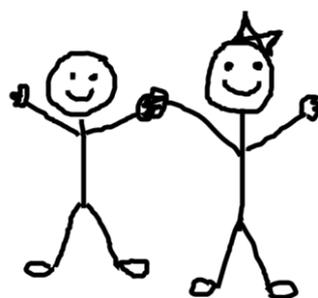


Figure 12: Childish drawings

By introducing each of the issues at the beginning of the session, it helped the participants in getting a better understanding on each of these. Although, we discovered that one of the issues were difficult to distinguish from another. The issues in question were at that time personal (now called *Personalised*) and individual needs (now called *Adjustable*), which the participants thought were the same thing. The issue mostly appeared due to the wording of the issues, making it hard to understand. An explanation were provided for each issue, making it easier to understand the issue in question.

We discovered that having the same participants involved for the design workshop lead to design suggestions that they had already brainstormed in the focus groups. This meant that the session gave them an environment, in which they could refine their ideas. Another approach could have been, to include people who had not been included in the study and that wanted to give up smoking or were currently trying to quit smoking. By presenting the issues to people who are not aware of the previous focus groups, new insights and/or perception can be gathered.

We chose to let the participants sketch ideas, as sketches are quick, inexpensive, plentiful, disposable, minimal detailed and exploratory [5]. By using this approach, we were able to gather multiple ideas from the participants quickly, that can be very detailed in thought, even though the sketch themselves are simple. Another approach could have been to include different probing materials for the participants to work with,

such as clay, sticky notes, different coloured paper etc. which can lead to interesting and creative design solutions.

During the design workshop, we found that it can be difficult to encourage people to draw sketches. Occasionally, we had to come up with examples and questions regarding the issues in order to get them started. This raises an interesting consideration, when conducting design workshops, due to the fact that by giving examples, you risk influencing their way of thinking. On the other hand, it can be very difficult to begin drawing sketches, without any ideas beforehand, making examples an important aspect to begin sketching. A solution could be to limit the users, by letting the focus be on a specific technology, such as smartphones. The reason why we choose not to focus only on this type of technology was because we did not want to limit the participants in terms of creative outbursts. By drawing situations or different types of technology that does not exist may lead to a gap that needs to be addressed. In some occasions, the participants chose to write text instead of drawing sketches. This was due to the reason that some features were considered difficult to draw, whereas with text the participants were able to get the idea down on paper quickly and more easily.

The participants were also limiting themselves by thinking of what is actually possible to create. This makes it difficult to come up with new ideas, due to the reason that the participants try to find solutions on how the technology could work, rather than how it should work. An approach that could help, in regards to not think of limitations, could be to use creativity tools, which can lead to new discoveries by playfulness and collaboration. An example of this can be read in *“Never Too Old: Engaging Retired People Inventing the Future with MaKey MaKey”*, where they supplied the participants with a MaKey MaKey toolkit in order for them to experiment and discover possibilities, which lead to ideas that were not limited by the thoughts of whether it was possible to create or not [9].

USER-CENTERED DESIGN APPROACH

In using a user-centered design approach for this context, we have received new knowledge in regards to smoking cessation technology. By including participants in the beginning of the development, it gave us the opportunity to better understand the users. We perceive these aspects very important in order to design smoking cessation technology, due to the difficulty found in developing technology for supporting users who are trying to quit. Through our literature review, we were surprised to find that the use of a user-centered design approach, within this domain, was minimal or non-existent.

A participant said the following in one of the focus group session:

“Send them a book of this transcription and then they will understand better.”

This states a need towards a better understanding of users, concerning their needs and thought on the domain surrounding smoking.

When comparing with last our last study [4], we can identify a difference in perspective on how to design technology for smoking cessation. In our previous study, the focus was to persuade users into quitting or support while quitting. The system developed, was a mobile application including 3 different types of content: tips, stories and motivators, each of which was randomly labelled as recommended either by a community or an expert. The design in this study focuses more on the user’s needs, including personal motivators towards quitting. Furthermore, none of the participants in this study mentioned a need for tips, stories or motivators, in the manner they were used in the previous study. This expresses the importance of considering user needs.

WORKING WITH SMOKERS

Working with current and previous smokers taught us that this is a very personal and sensitive topic. This means that caution should be applied, when working with people where smoking have or has been a significant part of their lives. When shown text targeted at smokers or screenshots of the QuitBuddy application the participants showed strong feelings and opinions and started referring to smoking cessations campaigns and the use of scare tactics on cigarette packages (An example of these can be viewed on the images below (Figure 13), using text to inform smokers how dangerous smoking can be). One of the participants said that the cigarette packages could just be a box with a big death cross. Smoking campaigns and scare tactics was perceived by most of the participants to not work, due to the fact that they did not make them want to quit.



Figure 13: Danish Cigarette package with the text “smoking can kill”

During the session we experienced that the participants rationalised, by including other health issue, such as obesity and alcoholism. This was due to the fact that they felt like the society was telling them off for smoking, whilst overlooking other health issues.

As experienced from our 9th semester study, quitting is a very private matter. The people attending our focus groups stated that they did not want to tell other people that they were quitting, due to the fact that they did not want the pressure and daily questions, such as “Are you still off the smoke?” and “How long have you been off the smokes?”. Furthermore, the study indicates that the participants felt that they would let the people they care about down by relapsing. Instead, it would be more helpful to talk with strangers who are experiencing the same thing as oneself and therefore will be able to show sympathy.

Due to the sensitiveness of the topic, we had to be careful on the wordings of each question so the participants did not feel condescended. In one of the sessions we experienced this, when asking what the participants liked about smoking. One of the participants did not like that phrasing, because she did not think of cigarette being part of an enjoyment, but a need.

When planning out the project, we expected that the participants would have difficulties opening up to the topics, due to it being a very personal matter. However, this was not something we experienced while conducting our focus groups. During each of the sessions we experienced that the participants gradually opened more up for even more personal things, which we did not expect. This involved stories about death in their respective families and personal sickness. This willingness to open up, might have been due to the choice

of using focus groups where the participants are together with other people who are having the same problems.

Working within the domain of smoking cessation has proven to be a challenge because none of us are smokers or have tried smoking before. This makes it difficult to get a fully understanding of the context and what is needed when trying to quit.

In the project we chose to use focus groups as an approach to get an insight into the context of smoking and smoking cessation. Based on our experience, we have considered another approach in order to get the necessary data. Since smoking can be a sensitive topic for some people, it might be an idea to use cultural probing [10] as a way to gather new knowledge. It may help people to be more open more, as they are not sitting in front of other people.

APPENDIX B: BIBLIOGRAPHY

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APPENDIX C: CD APPENDICIES

Participant documents

1. Table of participants
2. Email messages
3. Survey documents

Recruitment documents

4. Recruitment website files
5. Consent form
6. Stoplinien.dk banner
7. Business cards
8. Posters
9. Recruitment pictures

Focus group documents

10. Introduction
11. PowerPoint presentation
12. Questions
13. Transcriptions
14. Focus group pictures

Design workshop documents

15. Workshop approach
16. Introduction
17. PowerPoint presentation
18. Smoking cessation issues
19. Questions
20. User sketches
21. Design workshop pictures

Study documents

22. Affinity diagram files
23. Design suggestion
24. Research paper

This Master's Thesis uses a user-centered approach to designing smoking cessation technology; by conducting multiple focus groups and design workshops, the research team was able to gain knowledge on how technology can help within this context.

Overall, 12 issues were found, that should be considered when designing and developing technology in order to support people who are struggling with a smoking addiction. These issues were presented in the design workshops, in order for the participants to devise useful ideas on how technology could aid and support them.

In combining the findings from both the focus groups and design workshops, the research team was able to create a low-fidelity prototype, using smartphone technology to support users in this context.



**STEPHAN
RASMUSSEN**



**LARS
LICHON**