

# Using Calm Technology to design effective and satisfactory cues to nudge office workers

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## ABSTRACT

Most of the current communication technologies are highly intrusive, forcing us to drive most of our attention into the communication itself. In this research, the opportunities of implementing Calm Technology into the Hub were studied to reduce the attention needed to receive information during meetings. The Hub is a standing meeting station that accommodates different work-related tasks during a Workwalk, which is a walking route facilitating active meetings. This study explored how to effectively and satisfactorily nudge office workers to continue their Workwalk, by reviewing multiple cues with varying levels of intrusiveness. Results suggest that higher intrusiveness leads to increased effectiveness but lower satisfaction. However, insights show that information that helps users to anticipate and act accordingly increases effectiveness and satisfaction without being too intrusive, forcing and distracting. This work successfully explored the opportunities of designing calm cues that nudge users to prevent from lingering around the Hub.

## Author Keywords

Workwalk; Hub; intrusiveness; Calm Technology; cue;

## INTRODUCTION

Sitting has become the new smoking. 65-75% of working hours are spent sitting, of which more than 50% is accumulated in prolonged periods of sustained sitting [3]. The Workwalk is an outdoor walking route created to facilitate active meetings that counteract the inactive habits of office workers [7]. To complement the Workwalk, The Hub was designed: a standing meeting station meant to accommodate different work related tasks such as showing slides, note taking and browsing the internet. Multiple Hubs form a network of devices that can be used on the Workwalk route as wished [6].

The advantages of having a Workwalk with the Hub have been established [5]. However, previous research has shown that users linger around the Hub instead of continuing their Workwalk [11]. This not only defeats the benefits of having a Workwalk, but also creates problems when other groups of meeting office workers want to use the Hub. By nudging users of the Hub to walk on, the fundamental benefits of a Workwalk are retained, logistics are handled, and time management of meetings is improved.

The problem with nudging users of the Hub to continue their Workwalk is the risk of being intrusive and distracting during the meeting. To explore this presumption, two user studies with the following main research question have been conducted: *“How does the level of intrusiveness influence the effectiveness and satisfaction of cues - designed to nudge office workers to walk on to the next Hub during a Workwalk - communicated by the Hub?”*.

In this study, intrusiveness is defined as: a perception or psychological consequence that occurs when an audience's cognitive processes are interrupted [13]. Given the complexity and context-specific nature of satisfaction, the definition of satisfaction must be contextually adapted [8,9]. In this case, satisfaction is defined as: fulfillment of users wishes, expectations, or needs, or the pleasure derived from this [19]. When spoken about effectiveness, the following is meant: successfully nudging office workers to wrap up at the Hub and continue the Workwalk route.

As stated, two user studies have been conducted to explore how intrusiveness influences the effectiveness and satisfaction of cues communicated by the Hub. The first user study consisted of three focus groups meant to validate the initial ideas and to get some first insights on the designs. Five designs with varying levels of intrusiveness were evaluated. The second user study focused on testing the effects of presenting cues and whether these effects could be measured. Participants were therefore exposed to a system that they knew would guide them through a series of questions, without specifically knowing how. The guidance was in the form of cues divided in three phases, increasing the level of intrusiveness per phase as described in the interaction-attention continuum [1].

First, grounding theories on the topics Calm Technology, the Interaction-attention continuum and shared systems will be briefly summarized. Secondly, related work regarding Calm Technology and nudges will be discussed. Then, the cues evaluated in the second user test will be presented, as this design is a combination of the cues assessed in the focus groups conducted prior. Fourthly, the individual cues as used in the focus group will be discussed. After that, the methodology used to assess the cues, the results and conclusion will be presented.

## BACKGROUND

### *Calm Technology*

With the advent of computers and the internet, we have gotten access to any information desired. This results in an information overload, because most of the current communication technologies are highly intrusive, forcing us to drive most of our attention into the communication itself [2]. This is why 'Calm Technology' was formulated. Calm technology focuses on reducing the attention needed to receive information from products and services around us, which engages both the center and the periphery of our attention, and in fact moves back and forth between the two [22]. This way, new technologies that amplify humanness and retain human choice can be created [4].

### *Interaction-attention continuum*

To create designs with varying levels of intrusiveness, the interaction-attention continuum by Bakker and Niemantsverdriet was used [1]. According to their recent work, interfaces should facilitate interaction at varied levels of attention to seamlessly fit interactions with technology into everyday routines. Therefore, technology should support shifts between focused interaction, peripheral interaction and implicit interaction.

### *Shared systems*

Because all Hubs form a network of interconnected objects, contextual information can be used to change the system's output. This means that the interfaces can present the user with the right information at the right moment which helps to coordinate activities among each other, and to do actions in the right order, at the right time, and in the right way [16]. In the case of the Hub, this is important as the technology should facilitate interaction with not one, but multiple users at a time. Multiple people can interact with the system and interaction by one person can affect other people, meaning the Hub is a shared system [16].

## RELATED WORK

### *Calm Technology*

One of the key figures regarding Calm Technology is Amber Case. In her book, she describes multiple examples and suggestions to implement Calm Technology. She for example suggests creating ambient awareness through different senses: Use a status tone instead of a spoken voice, a buzz instead of a voice-based alert or a status light instead of a display. Besides giving tips for best practices, bad examples are also presented by Case. Think of the false alarm that the Nest smoke detector sent out. Apparently, the alarm could not be silenced leaving the user in an anything but calm state. Bravo et al. also conducted studies regarding ubiquitous computing and ambient intelligence [2]. In their attempt to create subtle interaction for a non intrusive communication, they designed a pair of augmented objects as a first prototype. The lamps provided three types of information: awareness, desire for contact and the urgency to make contact. The meaning of the messages was not defined

and therefore open to be decided by the users. These, and other examples given by these authors were used when designing the cues presented in this paper.

### *Nudges, cues, notifications*

One of the core features of mobile phones is sending notifications. Shirazi et al. conducted research into almost 200 million notifications from over 40,000 users to analyze what users like and dislike about notifications [18]. They conclude that notifications created by apps from different categories are valued differently by users. Overall, users value notifications from messaging, other communication applications, and calendar apps while notifications from system applications are not valued. This complies with work by Pielot et al.: they found that an increasing number of notifications was associated with an increase in negative emotions. However, participants did feel more connected with others when receiving extra messages and social network updates [17]. Their findings imply that avoiding interruptions from notifications may be viable for professional communication, while in personal communication, approaches should focus on managing expectations. Managing expectations with requests including explanations indeed results in significantly higher acceptance according to Westermann [23]. Their results also confirm that apart from being disruptive, notifications may create stress due to information overload.



## DESIGN

The starting point of all designs has been the Hub as shown in Figure 1. The Hub is a standing meeting station meant to accommodate different work-related tasks during a Workwalk, such as showing slides, note taking and browsing the internet [6]. A Hub has a screen on each of the four sides and an audio output. The Workwalk route contains multiple Hubs which are available for public use.



Figure 1: The prototype version of the Hub

### Interview experiment

The design for the interview experiment consisted of three cues presented to the participant in three subsequent phases. These three phases were used to gradually increase the level of intrusiveness, or in other words, move along the interaction-attention continuum. In this case, the cues were designed to slowly shift from the periphery of the attention to the center of the attention. The gradual increase of intrusiveness was integrated to meet the objective of effectively nudging the participant while staying away from being compelling or unsatisfactory.

In the ideal situation, the interview would have taken place during a Workwalk guided by multiple Hubs. In this ideal situation, phase one starts once the users arrive at the Hub.

The Hub displays soft green lights at the bottom of the meeting station. These lights gradually transition to orange as the urgency to walk on increases. When users keep standing around the Hub, a voice assistant politely asks the users to continue their Workwalk. The lights then slowly transition to red, after which a pop-up appears. This pop-up asks users to walk on once more. The pop-up can be dismissed one time for one minute to round up at the Hub. After that, the cue can't be closed and will therefore remain on the screens of the Hub until the users continue their Workwalk. A visual representation of the design as described can be seen in Appendix IV.

However, because of the Covid-19 situation, the approach of the user study has been shifted to online completely to guarantee the safety of the participants. To make the design feasible to test with during an online video call, a digital, screen-based version was created. Throughout each of the guided sections that each mimic a moment at an individual Hub, a progress bar is displayed at the top of the screen. This progress bar fades out from left to right while gradually changing from green to orange and eventually red. After the first phase of having enough time left, the progress bar has transitioned to orange and a cue pops up at the bottom right of the screen. This notifies participants that the last minute of that section is starting. The last phase is the closing phase, where at the end a big notification is displayed in the middle of the screen. This last notification blocks the list of questions and asks participants to continue with the next section. The visuals as used in the user study can be seen in figure 2.

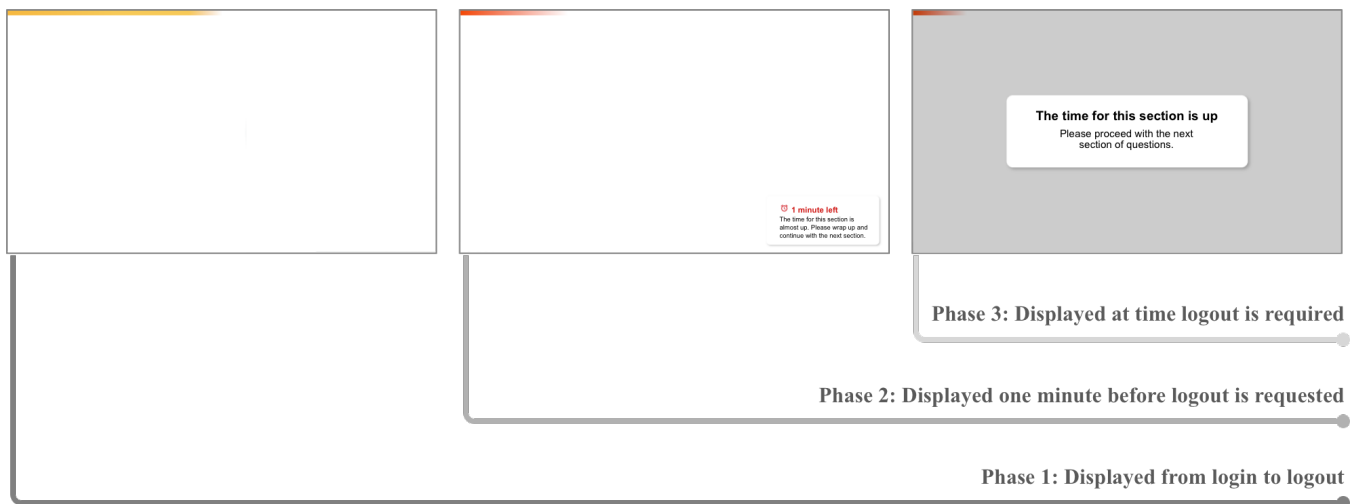
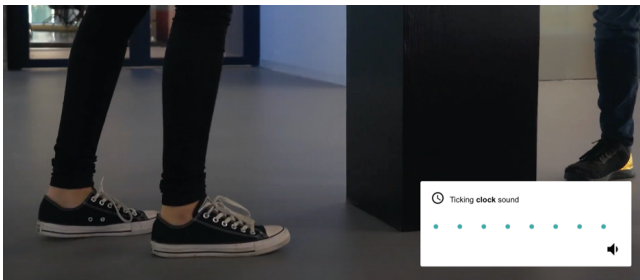


Figure 2: Visualization of overlays as used in the PowerPoint of the interview experiment

### Focus group designs

Five cues with varying levels of intrusiveness have been designed for the evaluation in the focus group. In order to be able to vary the level of intrusiveness, temporality and different modalities have been used. Cues one and two focused on sound. Cues three, four and five focused on sight. Cues two and five were designed to be instant, while cues one, three and four changed gradually over time.

Cue one uses sound to nudge users of the Hub to continue their Workwalk. It is the sound of a quietly ticking clock that transitions into a fast stopwatch over the course of two minutes. The sound starts at a low volume and increases over the same period of time. The sound starts playing when the last two minutes before the new group of people would arrive begin. This cue was created to represent a moderately intrusive cue.



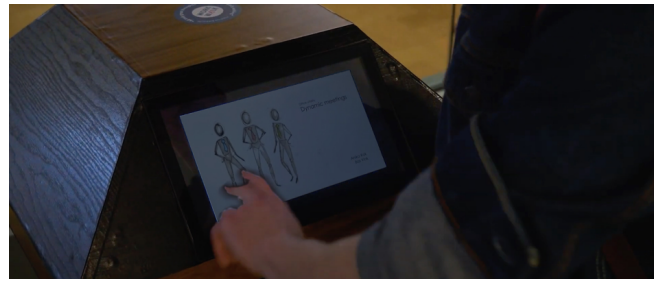
**Figure 3: Visualization of cue one, Ticking clock**

Cue two is a voice assistant that instructs users to continue their Workwalk. This cue uses sound like cue one but doesn't utilize temporality in the same way. This cue is instant: the audio is on a fixed level and is not announced by an accompanying sound. The voice assistant will immediately start talking at a clearly audible volume. Therefore, this cue was designed to be moderately intrusive. In the design as presented during the focus group, the voice assistant says: "You have been standing at this Hub for a little while now. Please continue your walk by following the route".



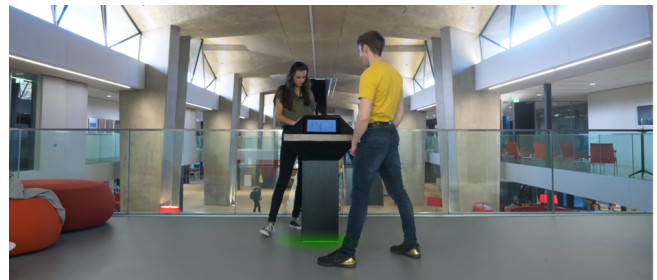
**Figure 4: Visualization of cue two, voice assistant**

Cue three was designed to be unobtrusive and sends a gradual visual signal to users of the Hub. The screen starts at full brightness but slowly gets darker once users are lingering around the same Hub for too long. The screen takes two minutes to decrease from full brightness to black. Once the screen is turned off, it can't be turned on again by the same group.



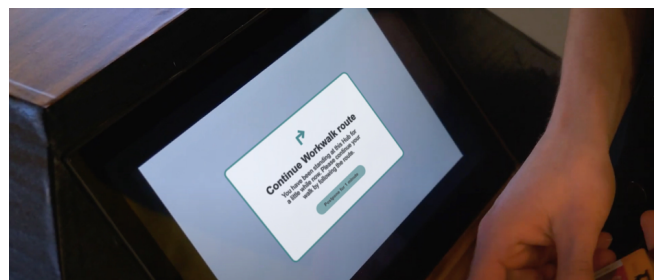
**Figure 5: Visualization of cue three, fading out screen**

Cue four communicates from the moment the users arrive at the Hub. It starts as a soft, green light that turns orange when users are at the same Hub for too long. The orange light finally turns red to indicate that the office workers are expected to move on as soon as possible. The transition between the orange and red light takes about two minutes. Besides the changing color, the brightness changes too: the light starts muted but becomes brighter over time. This cue was designed not to be intrusive.



**Figure 6: Visualization of cue four, colored lights**

Cue five is a pop-up on the screen that blocks all further actions. This instant, visual cue was designed to be intrusive and can be dismissed once for one minute so that the user can finalize the activity at the Hub. After that, the cue can't be closed and will therefore remain on the screens of the Hub until the users continue their Workwalk. The text of the pop-up says: "Continue Workwalk route: You have been standing at this Hub for a little while now. Please continue your walk by following the route".



**Figure 7: Visualization of cue five, pop-up on screen**

## METHODOLOGY

### Focus group

The objective of this paper is to test how intrusiveness influences effectiveness and satisfaction. The research question of the first user study is therefore: *“How are the variables ‘effectiveness’ and ‘satisfaction’ mapped by users when cues with varying levels of intrusiveness - designed to nudge office workers to walk on to the next Hub during a Workwalk -, are presented?”*. To validate the ideas and to get some first insights on the designs, three online focus groups were organized. In these focus groups, participants were encouraged to explore the designs and give feedback in their own vocabulary, by asking their own questions and pursuing their own priorities [10].

In the focus group research, five cues with varying levels of intrusiveness have been evaluated. In this experiment, primary, qualitative and quantitative data has been collected. The qualitative data consists of input from the group discussion and the semi-structured interview that was held at the end of the meeting. Quantitative data was also collected by means of five Likert scale questions and maps created by the participants during the focus group [14].

Participants were office workers and students that regularly have meetings with colleagues or fellow students. They were selected based on convenience sampling. The target group included people from age twenty to sixty years old. There were no gender, technology proficiency or other demographic requirements that participants had to meet to contribute to this study. In total, three focus groups with three participants each were held.

The focus group was online, using the video call software Skype and Miro: an online visual collaboration platform for teamwork [15,20]. The Miro board was used to present information and to fill in the Likert scale questions and mapping. All participants made use of the same Miro board, allowing them to collaborate on the joint mapping in the group discussion.

The focus group contained multiple phases: (I) an introduction of the topic, scope and study, (II) a presentation of the five cues, (III) a section for individual input, (IV) a group discussion and (V) a semi-structured interview to round off the session. Phase one to three were used to prepare participants for the joint section. In these phases, they were able to ask questions and define their individual opinions, before presenting these in the group discussion. The full script, designs and consent form template can be found in appendix I to III.

The set of designs used in the focus group was compiled by selecting five designs varying on the level of intrusiveness. To validate this estimate, each design was assessed using a Likert scale question [14]. These questions were filled in individually by all focus group participants as preparation for the following phases. After also mapping the designs

individually in a coordinate system, each of the groups jointly mapped the designs in the group discussion.

The five cues were visualized as presented in the chapter ‘Design’ and presented in a different order in each focus group to ensure the validity of the results. The quantitative input on the Likert scale has been processed by calculating the scores. The results of the mapping have been compared by converting the designs and merging these into one coordinate system. The qualitative data was processed by using affinity diagramming [21].

### Interview experiment

In the second user study of this research, an iteration of the cues has been evaluated in an online interview setting. The objective of this experiment was to test what the effects of cues communicated to users are, and how these effects can be measured. Therefore, participants were asked to answer questions as presented via screen sharing. They were told they were expected to take the lead and that the interviewer would not interfere. The system would guide them and the participant could ask the researcher to present the next slide when desired. No details on what the guidance would look like were provided so that the first, uninfluenced reaction of participants could be observed.

Through this LAB experiment, primary, qualitative data has been collected [12]. The target group of the interviews was the same as for the focus group. The study aimed for four to eight people from different age categories. In total, six interviews including one pilot test have been conducted. Based on the pilot test, only the timing of the cues in the design has been adjusted. Therefore, the results of the pilot test have been included in the final results of this study.

The interviews were held using online video call software. After an introduction of the test and topic Calm Technology, the researcher presented nine questions divided over two sections on the screen. Participants were asked to answer these out loud, without the interference of the interviewer. By making the participant the leader of the meeting, the reaction to the cues that were presented could be observed. Section one and two of the slides as presented on the screen contained the questions and design meant to nudge the participant. Section three contained an interview used to reflect and an introduction to the Workwalk and Hub. After introducing these, participants were asked to evaluate the same designs but in the context as just presented.

The qualitative data from the interviews was analyzed by using an affinity diagram [21]. Hereby was focused on the answers regarding the cues, not the answers on the questions as presented on the slides. The behavioural data collected in the video recordings was analyzed by looking at the general behaviour and making notes of any remarkable actions or reactions. These too were included in the affinity diagram [21]. The full script, designs and consent form template can be found in appendix I, IV and V.

## RESULTS

### Quantitative data focus group

Figures 8, 9 and 10 show how intrusive participants rated the designs to be in three Likert scale questions. Figures 11 and 12 show how subtle participants perceived the designs, also evaluated in Likert scale questions.

Each of the groups jointly mapped the designs in a coordinate system. The results of this mapping can be seen in Figures 13 and 14. The higher the intrusiveness, the higher in the coordinate system. The higher the satisfaction, the more to the right in the coordinate system. The results of the mapping can roughly be summarized as follows: the satisfaction is low for designs one and five, neutral for design three and high for designs four and two. The effectiveness is low to neutral for designs one and four and high for designs three and five. The effectiveness of design two is predominantly high with one outlier that is very low.

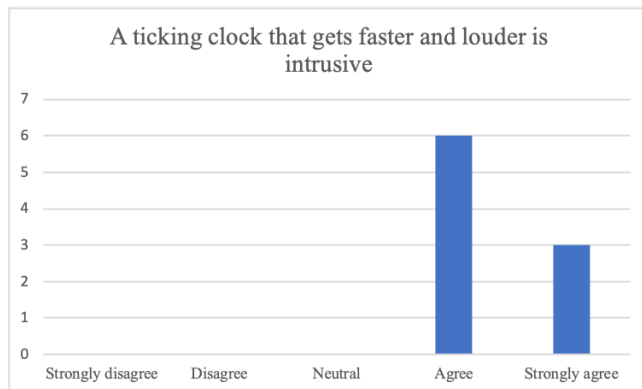


Figure 8: Results Likert scale cue 1

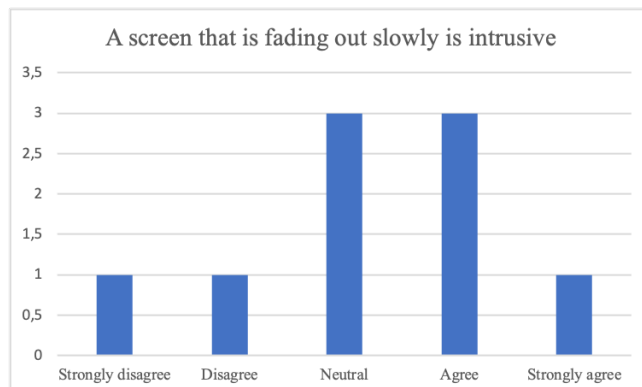


Figure 9: Results Likert scale cue 3

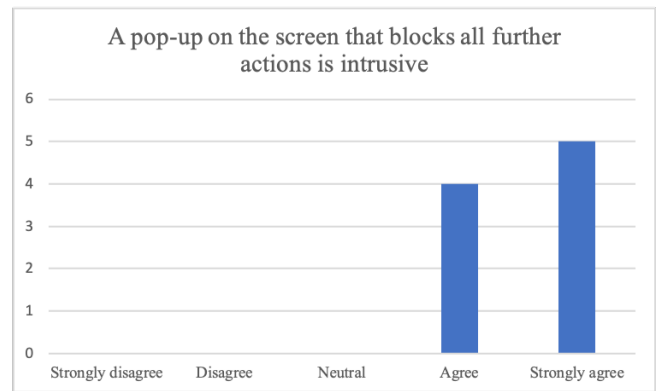


Figure 10: Results Likert scale cue 5

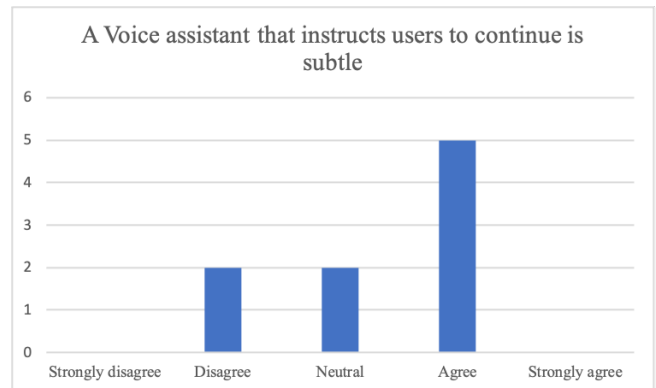


Figure 11: Results Likert scale cue 2

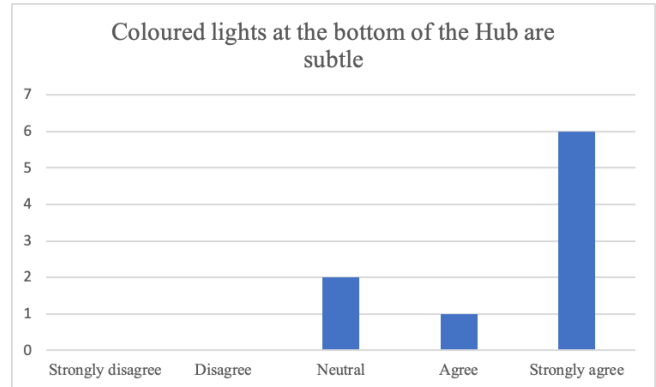


Figure 12: Results Likert scale cue 4

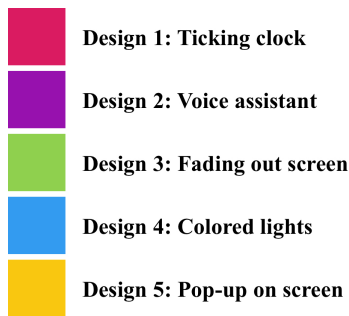


Figure 13: Legend for results of joint mapping in focus group

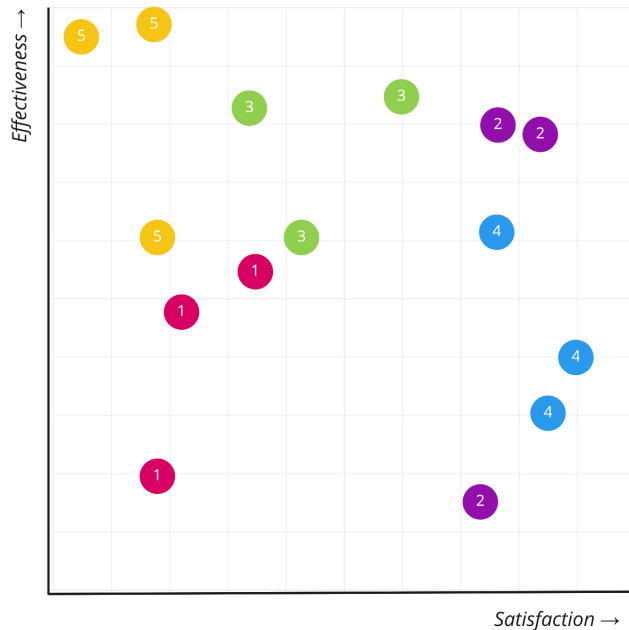


Figure 14: Results of joint mapping in focus groups

#### Qualitative data focus group

All participants indicated that the ticking clock will result in an irritated, hurried, nervous feeling that distracts from a meeting. Two participants stated that it might be unclear to users what the sound means and is trying to communicate. Even though the sound is not something you can ignore, you can ignore the cue and keep using the Hub until a next group of users arrives. One participant suggested that it would be better to hear the sound once in a while, rather than continuously from the moment the Hub detects a new group is approaching. The experience also depends on the audio level and how much this increases over time.

All participants agreed that the cue by the voice assistant would be nice and unobtrusive, as long as the volume, tone and message is friendly. The effectiveness of this cue depends on the implementation. For instance: the frequency with which the voice assistant asks users to leave influences the tendency to follow the suggestion to leave the Hub, thus the effectiveness. Multiple participants note that the cue can be ignored when wished. This cue has been the favorite of two out of three focus group sessions due to the balance between intrusiveness, effectiveness and satisfaction.

The fading screen is perceived effective because the end state of the screen is black. Participants state that this means you can't use the Hub anymore, which forces continuation of the Workwalk. Opinions about the variable 'satisfaction' are divided: some participants find the cue satisfactory because of the gradual change, while others find the forcing end state of the cue annoying. A suggestion to increase the satisfaction given in two of the focus group sessions is to make the screen dark but not black. This allows users to keep interacting with the screen when necessary, even though the time is up.

In case of the gradually changing colored lights at the bottom of the Hub, the constant presence of the information on the time that users have left is useful according to most participants. One participant also states that the lights are helpful for the approaching group as well. They can see the status of the current user group from a distance and can anticipate based on that information. The effectiveness of this cue is estimated to be low because of the possibility to ignore it. Some participants also state that the lights may not stand out enough for users to notice. A few participants also mention that the colors of the lights might not be a clear indication of what the Hub is trying to communicate at first use. The latter two statements both lower the effectiveness of the cue.

The pop-up notification on the screens of the Hub is perceived intrusive by all participants. All participants agree that this cue will be unsatisfactory and some even state that this way of communication would be a motive to stop using the Hub in the future. The reason being that the notification appears abruptly and can't be dismissed. Participants from one focus group session agree that this type of cue would leave users feeling rushed to finish their story because of the fear of being interrupted. Participants state that this cue would be highly effective because of the impossibility to ignore the cue. They feel forced to stop using the Hub and continue the Workwalk.

In all focus group sessions, the possibility to combine multiple cues was mentioned to increase effectiveness and/or satisfaction. Participants suggest combining the lights at the bottom of the Hub with the voice assistant and the pop-up or fading screen. The benefit of the colored lights is the possibility to see the level of urgency to leave constantly. Multiple participants suggest that such a timer can also be incorporated in the screens of the Hub. The possibility to see the progress of the meeting constantly supports time management and increases satisfaction because it helps to keep track of the meeting and to come to the point of the story or discussion. In one of the sessions, making use of a special meeting agenda template is being suggested. The idea is that this template helps users to plan their meeting in a way that fits the timeframe of the route and available time at each Hub. This results in higher satisfaction and effectiveness, since users won't be cut off by a notification. One participant proposes to implement the option to continue the tasks of the Hub on a personal phone, so that slides can be viewed on the



Workwalk route. Participants agree that sound cues are more triggering than visual cues as they are more difficult to be ignored. One participant notes that a combination of multiple cues with different modalities will serve the most people as it takes the most possible personal preferences into account. This will therefore increase both effectiveness and satisfaction.

#### **Qualitative data interview experiment**

In most of the interviews, no convincing reactions to the presented cues were observed. Most of the participants looked away from the screen often while answering the questions and/or didn't respond to the cues as they appeared. Phase one of the design, -the progress bar- wasn't noticed by all but two participants. After showing the cue in the interview, all participants state that the information presented by the progress bar is useful. However, the design is too discrete to notice if you are unaware of its presence, focus on something else on the screen or look away from the screen often. The usefulness of the descending bar lies in the fact that users of the Hub can track the progress of the time left and can anticipate accordingly. This means that they can start rounding off the tasks that need finishing at the Hub or notify other users that they need to do so. Being able to anticipate and adjust the meeting increases satisfaction as there is no forced action or harsh distraction.

One of the participants that did see the progress bar during the questionnaire phase of the test said that he thought it was part of the slide design. The other participant that saw the progress bar himself mentioned that he thought it was not relevant and that he should focus on the questions. The effectiveness of this cue can be improved by increasing the visibility. Multiple participants state that this can be done by transforming the progress bar on the screen to lights that are embedded in the Hub, for instance in the edges or on the top. This way, the information will be more visible, even when not looking at the screen.

Phase two of the design, -a small pop-up at the right bottom of the screen- was noticed by most of the participants. They state that it is nice that there is a concrete time indication as that again helps with anticipating on what to do. It provides structure and clarity in the meeting. All participants that saw the cue mention that they only read the title rather than all text in the pop-up. To increase the effectiveness and to lower the intrusiveness of the cue, participants suggest shortening the text as that helps with scanning quickly, without needing too much attention.

The satisfaction of the cue is good because it gives information but doesn't distract too much and doesn't force users to do something immediately. To increase satisfaction and lower intrusiveness, the cue could be smaller in size to prevent from unnecessarily blocking content on the screen.

Participants are divided when it comes to receiving extra information regarding the reason to walk on. Some participants state that knowing a new group is arriving would

help motivate them to walk on. This would increase the understanding of the urgency to walk on and will add social pressure, thus improving effectiveness. However, others say they won't need this information as they would be able to see a new group approaching with their own eyes, or because they want to focus on their own objectives while meeting at the Hub.

A big pop-up in the center of the screen was shown as the last part of the design. Not every participant saw this cue during the questionnaire phase as they were fast enough with answering all questions. However, all participants were introduced to the cue during the interview. Participants mention the cue was highly intrusive and effective, yet unsatisfactory and annoying. The cue was forcing continuation, even when the participant wasn't ready to move on. Therefore, the cue was disturbing and unwanted.

*"I think the system should only hint and not force".*

The satisfaction of this cue can be improved by adding the option to dismiss the cue. This way, users are not imposed to take action. Though satisfaction might be benefitted by this improvement, the effectiveness will decrease, as users are able to ignore the cue and keep using the Hub.

In addition to the suggestions that participants gave to improve for the existing designs, new ideas about nudging users were proposed. A voice assistant, music, a video and heat lamps were suggestions given to implement as design improvements.

## DISCUSSION

Overall, participants agree that cues shouldn't force action to prevent unpleasant situations. This will leave users feeling distracted, annoyed and pressured. Examples are not being able to finish important discussions or notes. This connects to intrusiveness, as results suggest that unexpected, interfering and/or forcing cues are perceived intrusive. Anticipation seems to be the key, meaning that cues that inform on how much time is left are useful, as long as the user has the freedom to choose when to move on. This suggests that cues and the information they communicate are seen as an indication rather than something that participants want to act upon immediately. This reflects to the participant's understanding of effectiveness: a cue is perceived effective when it prompts action. Immediately, or in the near future. When evaluating cues, participants tend to value satisfaction more than effectiveness.

Prior knowledge for noticing and understanding the cues is important to ensure effectiveness and satisfaction. This would also help with anticipation and time management. Time management appears not only important when reviewing the effectiveness and satisfaction of cues, but for meetings using the Hub in general. Participants expect that the cues will help stay within the timeframe set for the meeting which is a big and desired improvement compared to the current situation without the Hub. This is in line with how participants interpret satisfaction. The results suggest that participants make a distinction between short-term and long-term satisfaction. Short-term affects the feelings of the user at the time of receiving the cue or right after that. Long-term satisfaction has to do with the overall satisfaction of the Workwalk and its effects like improved time management.

When combining both user studies, insights suggest there is a connection between the level of intrusiveness and the level of effectiveness and satisfaction. The more intrusive and forcing a cue is, the lower the satisfaction. Higher intrusiveness can mean higher effectiveness. However, the results indicate that when information is given so that users can anticipate, effectiveness goals can be met without being too intrusive, forcing and distracting. Examples are the progress bar and the small pop-up at the right bottom of the screen as presented in the interview experiments. A friendly, calm voice assistant who asks to continue walking is also expected to the requirements of being unobtrusive yet effective and satisfactory according to participants.

Social pressure seems to change this balance, as it adds acceptance towards the cues according to multiple participants. This means that participants are more likely to respond to nudges given by the Hub in case of social pressure, for instance when a new group of meeting people is approaching.

The salience and interpretation of cues seem to be important aspects that determine effectiveness and satisfaction. Results imply that cues that are only presented shortly on the screen in an inconspicuous way, will not be noticed by users in all

cases. Auditory and visual cues that exceed from the screens of the Hub need to be explored to find a good balance between unobtrusiveness, effectiveness and satisfaction.

## Limitations

During the performance of the user studies, a few limitations have been noted. In the focus group, each of the five designs has been presented through multiple visuals, a short description with time indication and a verbal explanation by the researcher. The communication of the designs was not specific enough and therefore left room for personal interpretation. The same goes for the parameters intrusiveness, effectiveness and satisfaction. Although a description was given in the introduction, the personal interpretation will have influenced the results. An example is design 5, the pop-up on the screen. This pop-up could be dismissed once, which was not clear for all participants.

To ensure the safety of participants, even though the COVID-19 situation, it was chosen to perform all user studies remotely. In case of the interview experiment, this has led to significant adjustments in the setup. One of the biggest challenges was to make participants feel like they had responsibility regarding the course of the meeting. They had to feel the need to respond to the cues, even though they didn't initiate the meeting. Although the setup has been adjusted to facilitate this as well as possible, some participants stated that they didn't expect the cues, or that they didn't feel like the cues were applicable to them.

A limitation of the user studies in general lies in the sample group that was used. In total, fifteen people participated in the focus group and interview experiments. More research is needed to make the sample size bigger, thus the results more reliable. Different age groups and people with disabilities need to be heard in order to draw valid conclusions, not only on the effects of intrusiveness on effectiveness and satisfaction, but also on the design decisions made for the cues communicated by the Hub.

To address the limitations and to confirm the conclusions regarding the effects of intrusiveness on effectiveness and satisfaction, further research is needed. Besides, research in context is needed to validate the cues and to improve the design as presented. This also applies to the generalization of the insights. In this case, all designs were created with the same objective: to nudge meeting office workers to continue the Workwalk. In order to make the insights as presented applicable to other situations with different objectives, further research is needed.

## **CONCLUSION**

This research aimed to explore the relation between intrusiveness, effectiveness and satisfaction. The results can be used for future development of unobtrusive cues in the work environment. In this case, the insights will be used to create cues that can be communicated by the Hub, meant to nudge office workers to continue their Workwalk. The results of the focus group and interview experiment suggest that higher levels of intrusiveness lead to increased effectiveness but lower satisfaction. However, insights show that information that helps users to anticipate increases effectiveness and satisfaction without being too intrusive, forcing and distracting. This research clearly illustrates the possibility to create unobtrusive yet effective and satisfactory cues, but raises questions about how the practical implementation of these designs will work in a non-simulated context. To confirm the results and improve the designs as tested, future studies could explore the cues as presented with a bigger, more inclusive sample in the actual context. Future studies could also address new contexts to generalize the findings and make them more widely applicable.

## **ACKNOWLEDGMENTS**

I would like to thank Harm van Essen for coaching me during this project. I would also like to thank Yaliang Chuang for guiding our squad, organizing informative workshops and for the feedback and guidance during this project, even though the difficult Covid-19 situation. I would also like to thank all of the coaches within the squad for their time and effort to provide useful feedback and help. Finally, I would like to thank all study participants and everyone in the squad that helped me develop and improve myself and my project.



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## APPENDICES

### Appendix I: Ethical Review Form Education

# Ethical Review Form Education

(Version 17.07.2020)

This Ethical Review Form should be completed for every research study that involves human participants or personally identifiable data. The form should be submitted and approved by your supervisor before potential participants are approached to take part in the

## Part 1: General Study Information

1	Student name and email	Anika Kok a.k.kok@student.tue.nl
2	Supervisor name and email	Yaliang Chuang y.chuang@tue.nl Harm van Essen H.A.v.Essen@tue.nl
3	Degree Program	Industrial Design
4	Bachelor/master	Master
5	Bachelor/master end project?	No
6	Course name and code	DFP005 Seamless interaction design for professionals
7	Project title	Calm Technology in the Hub
8	Research location	Eindhoven
9	Research period (start/end date)	November 2020 – February 2021
10	[If Applicable] Proposal already approved by (external) Ethical Review Board: Add name, date of approval, and contact details of the ERB	-
11	Research question	<p><i>How are the variables 'effectiveness' and 'satisfaction' mapped by users when cues with varying levels of intrusiveness - designed to nudge office workers to walk on to the next Hub during a Workwalk -, are presented?</i></p> <p><i>How can the user experience of cues - designed to nudge office workers to walk on to the next Hub during a Workwalk -, be tested, focusing specifically on the parameters satisfaction, effectiveness and intrusiveness?</i></p>
12	Description of the research method	<p>This study will consist of two parts: an online, remote focus group and a semi structured interview.</p> <p>The first step is validation by means of a focus group. The researcher has created a hypothesis</p>

## Ethical Review Form

		<p>regarding the effect of the level of intrusiveness on effectiveness and satisfaction. Five cues varying on the scale of subtleness ↔ intrusiveness have been mapped by the researcher after which the same will be done by the participants of the focus group. The focus group will be online to ensure the safety of the participants. A short introduction will be given after which participant first make a mapping individually and end in a group discussion to come to a joint mapping. This will be done via Skype and Miro so that the researcher can observe the discussion and collect its results. There will be two focus groups in order to keep the discussion manageable online. The first group is already familiar with the Workwalk and its concept. The other group has never heard of the Workwalk and will be newly introduced before the discussion starts.</p> <p>The semi structured interviews will be held after the two rounds of focus. These are meant to look at the effects of the cues and whether these can be measured. This test is meant as a sort of pilot test and will therefore aim for a small sample size of four to six people. The results of this pilot test can be used to set up follow-up research with a more substantial sample size.</p> <p>In the interviews, the researcher and participants will go on a Workwalk in which (a selection of) the designed cues are implemented following the Wizard of Oz method. Participants can react to these after which the researcher asks questions about their experience.</p> <p>Both of these tests contribute to answering the following question: Which level of intrusiveness leads to a good balance of both satisfaction and effectiveness when nudging office workers to walk on to the next Hub during a Workwalk?</p>
13	Description of the research population, in- and exclusion criteria	<p>The target group includes people that work at large offices, campuses or other locations suitable for a Workwalk (walking meeting), either with or without the Hub. The study aims for working people or students with no further requirements or conditions to exclude participants.</p>

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14	Number of participants	The focus group will have six participants. The interviews will be held with approximately four participants.
15	Explain why the research is socially important.	<p>Sitting has become the new smoking. Globally, ~40% of global individuals with cardiovascular disease, diabetes or cancer failed to achieve the minimum recommendations for health of 150 min/week of moderate-intensity physical activity. In high-income countries in Europe and North America, this figure rose to ~70%. For those working in offices, 65-75% of their working hours are spent sitting, of which more than 50% of this accumulated in prolonged periods of sustained sitting (Buckley et al., 2015). Meetings are a pervasive workplace activity where organizations accomplish much of their work (A. Allen et al., 2014).</p> <p>I will address the Workwalk, which is a service design by Damen et al., (2019) and how the Hub that accompanies this Workwalk (Damen et al., 2020) can be improved. The Workwalk and Hub are designed to motivate people to be more active during their workday, which can help improve general health of office workers. There are no expected harmful situations connected to this research.</p>
16	Describe the way participants will be recruited	Participants will be selected based on convenience sampling meaning they are part of the network of the researcher.
17	Provide a brief statement of the risks you expect for the participants or others involved in the research and explain. Take into consideration any personal data you may gather and privacy issues.	<p>This study involves minimal risks for the participants. Participants will not be exploited, and the research plan will be fully revealed before the start of the study. The researchers will have access to this data only with prior consent from the participants, who can decline to share their results at any moment. No children will be involved in this study.</p> <p>The focus group and interviews include only low risk information with results being only presented in anonymized form (excluding the researchers involved in this project). Hence, I expect no risks from the questionnaires for the participants. Interviews and observations conducted will be focused exclusively on the usage and experience of using the prototype(s). Additionally, the tasks that will be asked from participants in order to structure</p>

## Ethical Review Form

		<p>evaluations and tests will be such that they do not deviate from regular activities in the specified context.</p> <p>The data will be kept on a password protected, personal computer or password protected academic online platform at the Eindhoven University of Technology. The personal data related to the study will be anonymized, and test subjects will never be recognizable in publications, academic material or any other mean. The results of this study can be disseminated in scientific conferences and published in scientific research journals.</p>
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## Ethical Review Form

Part 2: Checklist for Minimal Risk			
		Yes	No
<b>1</b>	Does the study have a medical scientific research question or claim (see definition below)  <i>Medical/scientific research is research which is carried out with the aim of finding answers to a question in the field of illness and health (etiology, pathogenesis, signs/symptoms, diagnosis, prevention, outcome or treatment of illness), by systematically collecting and analysing data. The research is carried out with the intention of contributing to medical knowledge which can also be applied to populations outside of the direct research population.'</i>	<input type="checkbox"/>  If yes or maybe: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	<input checked="" type="checkbox"/>  If no: Continue with question 2
<b>2</b>	Does the study involve human material (such as surgery waste material derived from non-commercial organizations such as hospitals)?	<input type="checkbox"/>  If yes or maybe: This is only allowed if your supervisor has consulted with the medical coordinator. Continue with question 3	<input checked="" type="checkbox"/>  If no: Continue with question 3
<b>3</b>	Will the participants give their explicit consent – on a voluntary basis – either digitally or on paper? Or have they given consent in the past for the purpose of education or for re-use in line with the current research question?	<input checked="" type="checkbox"/>  If yes: Continue with question 4	<input type="checkbox"/>  If no: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval
<b>4</b>	Will the study involve discussion or collection of personal data? (e.g. name, address, phone number, email address, IP address, BSN number, location data) or will the study collect and store videos, pictures, or other identifiable data of human subjects?	<input checked="" type="checkbox"/>  If yes: The handling, storing and de-identification of the personal data should be discussed with your supervisor. Continue with question 5 if you	<input type="checkbox"/>  If no: Continue with question 5

## Ethical Review Form

		met all requirements for handling personal data (see ...)	
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## Ethical Review Form

		Yes	No
<b>5</b>	Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. children, people with learning difficulties, patients, people receiving counselling, people living in care or nursing homes, people recruited through self-help groups)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 6
<b>6</b>	May the research procedure cause harm or discomfort to the participant in any way? (e.g. causing pain or more than mild discomfort, stress, or anxiety)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 7
<b>7</b>	Will the participants receive any compensation for their participation? Such as a coupon or a chance to win a prize?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with question 8 or 10, depending on the type of study (see red text below)
<p><b>The following questions 8-9 are for <i>observational</i> research (e.g. (semi-)structured interviews; focus groups; (participatory) observations). If your research is <i>experimental</i>, then skip questions 8-9 and continue with question 10</b></p>			
<b>8</b>	Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g. covert observation of people)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: This is only allowed when observing behavior in public space. If so, continue with question 9. If you observe people in non-public space without their consent, your supervisor should submit the study to the ERB. You cannot get	If no: Continue with question 9



## Ethical Review Form

		automatic ethical approval	
<b>9</b>	Will participants be asked to discuss or report sexual experiences, religion, alcohol or drug use, or suicidal thoughts, or other topics that are highly personal or intimate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	If no: Continue with part 3

## Ethical Review Form

**The following questions 10-13 are for *experimental* research (e.g. measurements on yourself or another person; testing a prototype/device; influencing behavior through manipulation (e.g. light or temperature). If your research is *observational*, then skip questions 10-13 and continue with part 3**

		Yes	No
<b>10</b>	Is the study invasive (i.e. it affects the body such as puncturing the skin; taking blood or other body material (such as DNA) from the participant)?	<input type="checkbox"/>  If yes: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	<input type="checkbox"/>  If no: Continue with question 11
<b>11</b>	Does the device have a medical purpose such as diagnosis, prevention, monitoring, prediction, prognosis, treatment or alleviation of disease or injury?	<input type="checkbox"/>  If yes or maybe: Your supervisor should submit the study to the ERB. You cannot get automatic ethical approval	<input type="checkbox"/>  If no: Continue with question 12
<b>12</b>	Will the experiment involve the use of physical devices that are 'CE' certified for unintended use (meaning you will use existing CE certified devices for other things than they were originally intended for)?	<input type="checkbox"/>  If yes: This is only allowed if they are completely harmless. They should have a harmless voltage of <5V and hazardous waste (fumes/gas/substances) should not be released. You should discuss with your supervisor whether you need to have the device tested for safety	<input type="checkbox"/>  If no: Continue with question 13
<b>13</b>	Will the experiment involve the use of physical devices that are not 'CE' certified?	<input type="checkbox"/>  If yes: This is only allowed if they are completely harmless. They should	<input type="checkbox"/>  If no: Continue with part 3

## Ethical Review Form

		<p>have a harmless voltage of &lt;5V and hazardous waste (fumes/gas/substances) should not be released. You should discuss with your supervisor whether you need to have the device tested for safety</p>	
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### Part 3: Enclosures and Signature

<b>1</b>	<p>Enclosures (tick if applicable):</p> <p><input checked="" type="checkbox"/> Informed consent form (link to template);</p> <p><input type="checkbox"/> The survey the participants need to complete, or a description of other measurements (such as interview questions or a description of the prototype);</p> <p><input type="checkbox"/> Text used to find participants (such as brochures, flyers, etc);</p> <p><input type="checkbox"/> Approval other research ethics committee;</p>	<p>Informed consent form: see Appendix to this file.</p>
<b>2</b>	<p>I hereby declare that I have completed this form truthfully</p> <p>Signature(s) of the student(s)</p> <p>Date</p>	

Discuss this form with your supervisor. If any of the boxes your ticked in Part 2 suggest that your supervisor should submit your study to the ERB for ethical approval, try to change your research design in such a way that your supervisor can approve it instead. If this is not possible, ask your supervisor to submit the proposal to the ERB. It will take two to five weeks before you receive a decision from the

### Part 4: Review by supervisor

	Yes	No
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## Ethical Review Form

<b>1</b>	Does the data storage adhere to all requirements of responsible data management (link toevoegen)?	<input type="checkbox"/>	<input type="checkbox"/>
		If yes: Continue with question 2	If no: Discuss with your student the necessary steps to adhere to the requirements
<b>2</b>	Does the research proposal adhere to all requirements for automatic approval?	<input type="checkbox"/>	<input type="checkbox"/>
		If yes: Please skip the questions 3-6 and sign the form	If no: Discuss with your student if any alterations can be made in order to adhere to the requirements for automatic approval. If you decide that the study cannot adhere to the requirements, then you as a supervisor need to submit the proposal to the ERB. Please answer the following additional questions (3-6)
<b>Additional questions for ERB approval</b>			
<b>3</b>	Elaborate on the topics from part 2 that do not allow for automatic approval. Describe how you safeguard any potential risk for the research participant for each topic.		
<b>4</b>	Describe and justify the number of participants you need for this research, taking into account the risks and benefits		
<b>5</b>	Explain if your data are completely anonymous, or whether they will be de-identified (pseudonymized or anonymized) and if so, explain how	All data in this study will be anonymized during the analysis phase. A screen and audio recording of the focus groups will be made but this will only be accessible for the researcher Anika Kok. She will use this to analyze the results of the study. All results will be shared in typed, anonymized form and therefore not traceable to the participants of the study. All data will be stored on a password protected personal computer. If the data needs to be stored online, only the anonymized versions will be uploaded.	
<b>6</b>	Who will have access to the data?	The researcher, Anika Kok has knowledge on personal data of the participants. This data includes a screen and audio recording, contact information and the signed	

## Ethical Review Form

		consent forms with name and signature. No other people will have access to this data.
--	--	---

### Part 5: Signature by supervisor

I hereby declare that I have completed this form truthfully	
Signature of the supervisor	
Date	

# Subject consent form

## User study M1.2. project Workwalk and The Hub

- I have been given information and I understand what this research is about. I was also able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate.
- I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this.
- I know that some people can access my data. These people are Anika Kok, Harm van Essen, Yaliang Chuang.
- I consent to gathering and usage of my data for scientific publication and additional research on my data.
- I consent to my data being stored at the research location for another 5 years after this study.

I want to participate in this study.

Name of study subject:

Signature:

Date: \_\_ / \_\_ / \_\_

-----

I hereby declare that I have fully informed this study subject about this study.

If information comes to light during the course of the study that could affect the study subject's consent, I will inform him/her of this in a timely fashion.

Name of investigator (or his/her representative):

Signature:

Date: \_\_ / \_\_ / \_\_

-----

*The study subject will receive a copy of the signed consent form.*

## **Information form for participants**

This document provides you with information about the study 'Calm technology in dynamic walking meetings'. Before the start of the study, it is important that you learn about the procedure and that you give your informed consent for voluntary participation. Please read this document carefully.

### **Aim and benefit of the study**

The goal of this study is to gain insights on how Calm technology can be used to improve the user experience of the Workwalk and the Hub. The study findings are used to write a paper about the topic that contains a summary of the results, an advice for the current design and an advice for further research.

This study is performed by Anika Kok; student under the supervision of Assistant Professor Harm van Essen at Eindhoven University of Technology (TU/e) at the Department of Industrial Design.

### **Procedure**

After signing this consent form, you will be asked to answer questions as displayed on the screen. I, the researcher will not interfere in this section as the system will guide you through the steps. I will listen and offer help when needed. After you have gone through the steps of the system, I will show you a video and ask interview questions to elaborate on the questions you have answered prior.

### **Risks**

The study does not involve any risks or detrimental side effects.

### **Duration**

The user study will approximately take 30 to 45 minutes.

### **Voluntary**

Your participation is completely voluntary. You can refuse to participate without giving any reasons and you can stop your participation at any time during the study. You can also withdraw your permission to use your data immediately after completing the study. None of this will have any negative consequences for you whatsoever.

### **Confidentiality and use, storage, and sharing of data.**

All research conducted at the Eindhoven University of Technology adheres to The Netherlands Code of Conduct for Research Integrity and the Code of Scientific Conduct. This study has been approved by the Ethical Review Board.

In this study personal data (e.g. your name, age, contact information and voice) and experimental data (e.g. your responses to questionnaires and interview questions.) will be recorded, analyzed, and stored under password protection. The goal of collecting, analyzing, and storing this data is to answer the research question and publish the results in scientific literature. To protect your privacy, all data that can be used to personally identify you will be stored on a secure TU/e environment. Only anonymized data, results and insights will be shared with third parties to ensure privacy.

### **Further information**

If you want to contact the researchers for for instance more information about this study, the study design, or the results, you can contact Anika Kok ([a.k.kok@student.tue.nl](mailto:a.k.kok@student.tue.nl)).

If you have any complaints about this study, please contact the supervisor, Harm van Essen ([h.a.v.essen@tue.nl](mailto:h.a.v.essen@tue.nl)). You can report irregularities related to scientific integrity to confidential advisors of the TU/e.



## Informed consent form

*'Processing in a tangible way'*

- I have read and understood the information of the corresponding information form for participants.
- I have been given the opportunity to ask questions. My questions are sufficiently answered, and I had sufficient time to decide whether I participate.
- I know that my participation is completely voluntary and for educational purposes. I know that I can refuse to participate and that I can stop my participation at any time during the study, without giving any reasons. I know that I can withdraw my permission to use your data immediately after completing the study.
- I agree to voluntarily participate in this study.
- I know that no information that can be used to personally identify me or my responses in this study will be shared with anyone outside of the research team.

### Certificate of consent - participant

I, .....  
want and provide consent to participate in this study.

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

### Certificate of consent - researcher

I hereby declare that I have fully informed this study subject about this study. If information comes to light during the course of the study that could affect the study subject's consent, I will inform him/her of this in a timely fashion.

Anika Kok

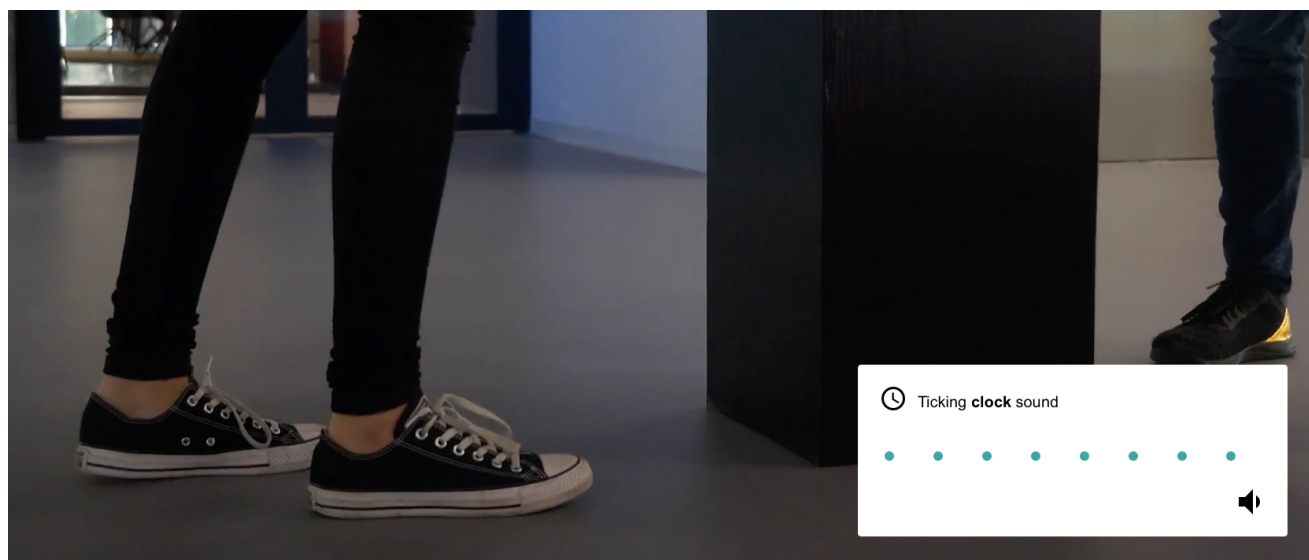
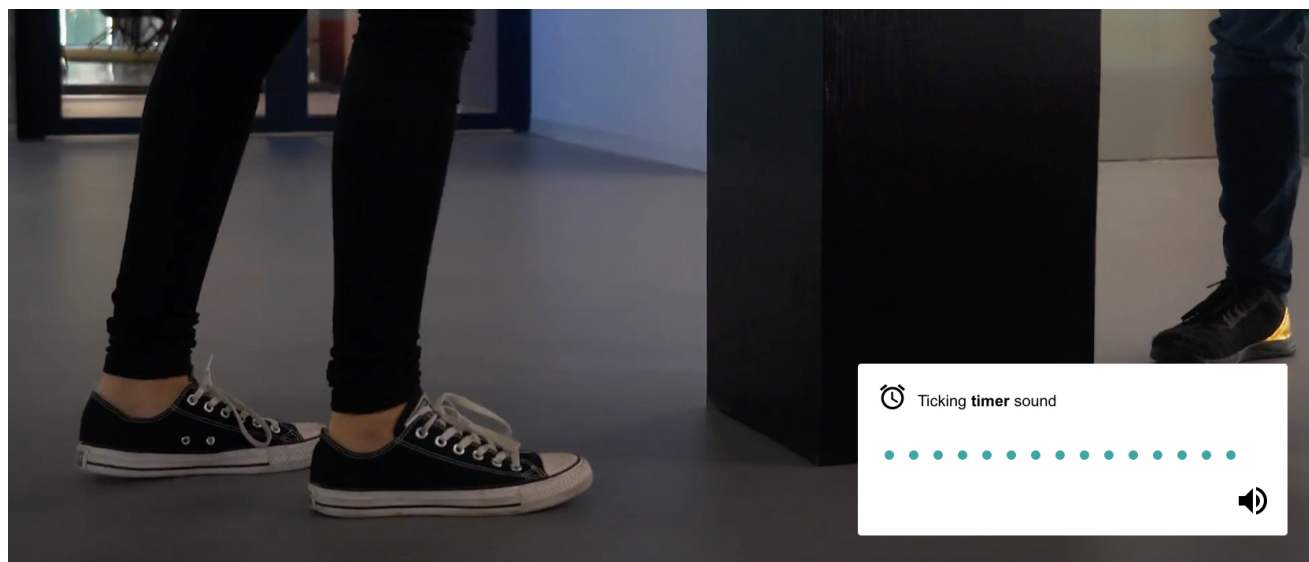


\_\_\_\_\_  
Researcher's Signature

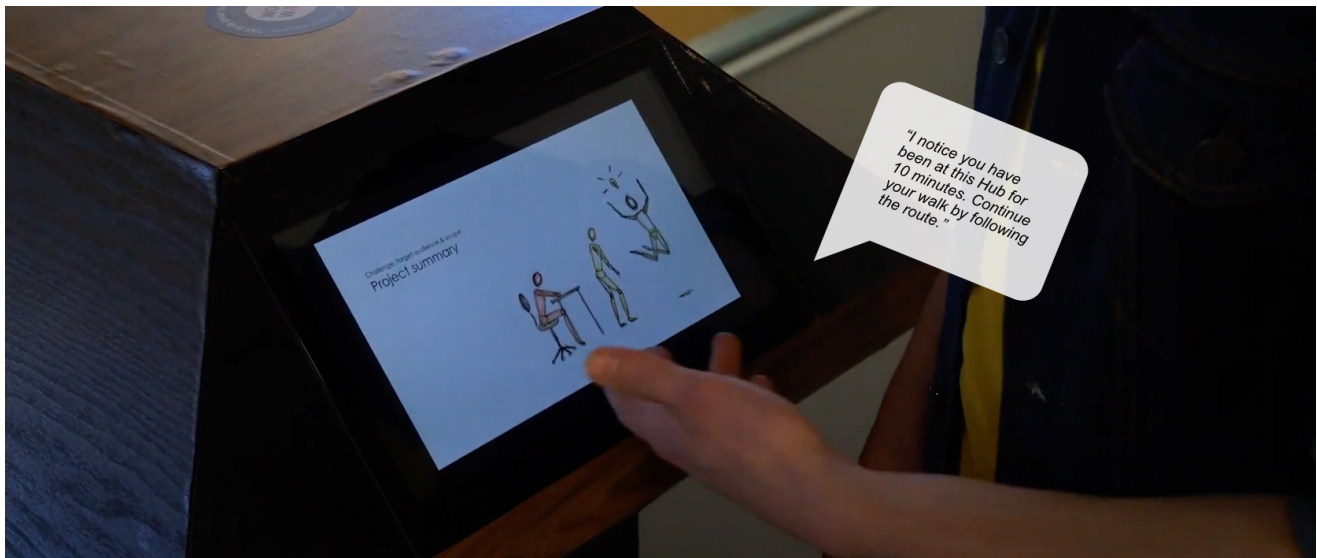
\_\_\_\_\_  
Date

## Appendix II: Designs focus group

Design one: A ticking clock

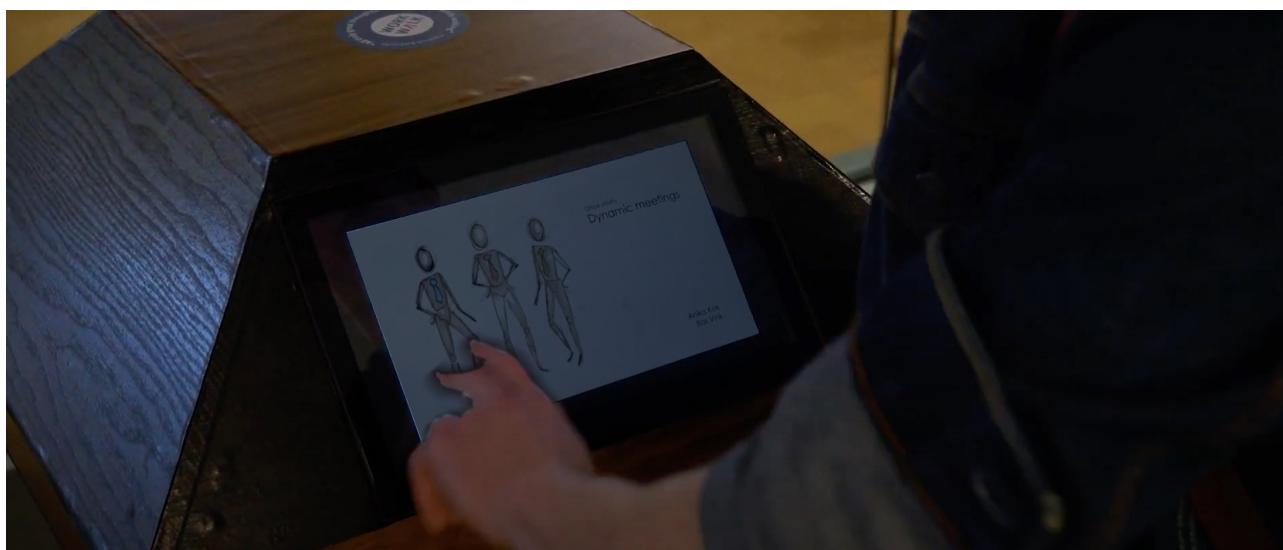


## Design two: Voice assistant





Design three: Fading out screen

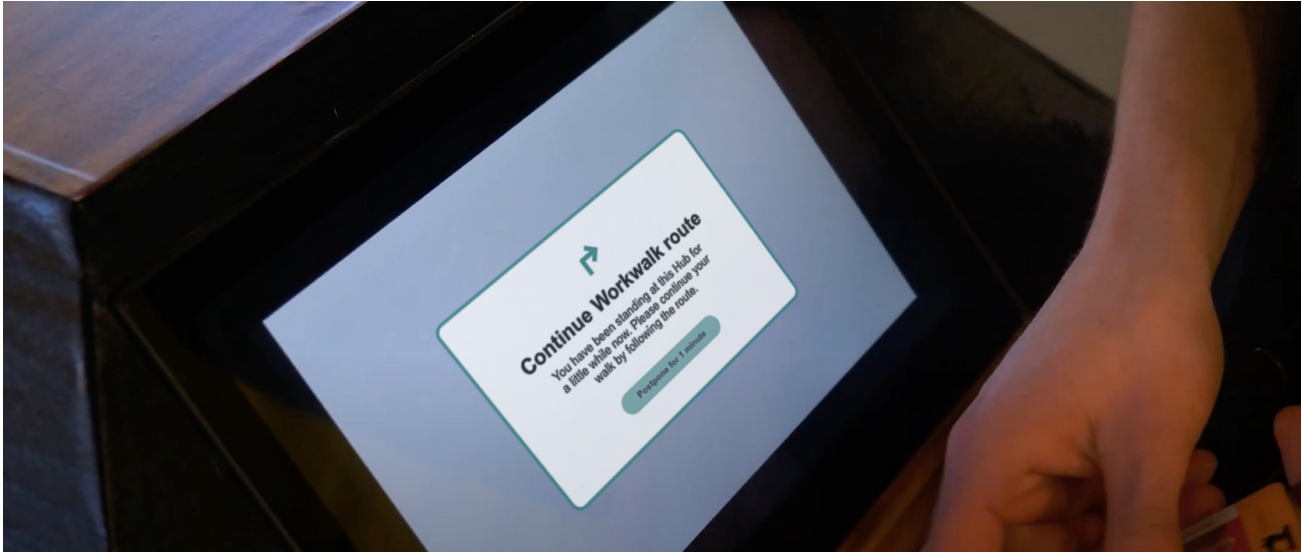




Design four: Colored lights



Design five: Pop-up on screen



### Appendix III: Script focus group

#### *Introduction of the Workwalk and Hub*

Thank you for participating in this study for my project. I am collecting information regarding the so-called Workwalk and Hub. The Workwalk is a concept that combines the benefits of walking with the meetings that most office workers have during their workday. Having a walk outside is often seen as a break, but the Workwalk is meant as part of the working day. Instead of having a regular meeting, sitting at a table in a meeting room, we would like to motivate people to have a walk while discussing work related topics. This means you can have a change of scenery during the day, without taking too many breaks and losing productivity. Because some meetings require the possibilities to show slides, make notes or show something on the internet, the Hub was designed. The Hub is a standing table that has screens on four sides, so the participants of the meeting can stand around the table and look at each other while having the screen in front of them.

#### *Introduction of the user test*

In this study, I am researching how we can give users cues to nudge them to walk on to the next hub. This is necessary to retain the Workwalk benefits and to manage logistics. In order to design the cues, I am looking into three parameters/characteristics: effectiveness, intrusiveness and satisfaction. In this session, we will look at five designs I made and map them according to the three parameters I just mentioned. The goal is to place all of the designs in a matrix like this. You can discuss together to come to a mutual decision on the characteristics.

#### *Signing the consent form*

##### *Set the scope*

To give you a little bit of guidance, I have a fixed scope/context for you. Imagine you are having a Workwalk with one colleague. You start at a hub, show some bullet points through slides on the screen and walk on to the next hub while discussing some matters as presented. After a few minutes of walking, you arrive at the next hub where you present some of the work you have done regarding the meeting topic. You end up talking about a lot of details with your colleague and linger around the hub while doing so. However, the next group of meeting people is approaching. The system detects they will be there in around three minutes and will therefore nudge you to walk on.

##### *Explain nudges*

Mapping individually (5 min)

Map the nudges individually first. You have a few minutes before we continue so think about it but go with your gut mostly.

##### *Mapping with the group (30 min)*

Discuss the mapping with the three of you and come to a joint decision on where each of the designs fits in this matrix. You have ten minutes to do this.

#### *Questions after mapping is finalized*

- Can you give me a summary of your results? And what is the summary of your thought process/discussion?
- Why have you come to this mapping? What were the most important arguments?
- Did you all agree?
- Does this differ from your own mapping? How? What made you change your mind?
- Do you have a suggestion of a design that would be best according to you?

#### *Additional feedback opportunity*

- What did you think of the test?
- Is there anything else I need to know, consider or takeaway? Any other feedback or are there any other thoughts regarding the topic that you would like to share with me?

*The researcher will ask more questions based on the course of the interview. This means that the researcher can ask new questions based on previous answers that are given, or that the researcher can ask extra questions if these occur during the interview.*



## Appendix IV: Design interview experiment



### Sectie 1

#### Vragenlijst sectie 1

1. Van welke app heb jij notificaties aan staan op je telefoon?
2. Wat vind je over het algemeen van deze notificaties?
3. In welke situatie is een notificatie nuttig en op welk moment juist niet?
4. Wanneer staat jouw telefoon op stil en wanneer niet?
5. Als het aan jou lag, wat zou er dan anders zijn aan de notificaties die je telefoon verstuurt?



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**Nog 1 minuut**  
De tijd voor deze sectie zit er bijna op. Rond afsluit af en vervolg met de volgende sectie.

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De tijd voor deze vragenronde zit erop.

Vervolg alstublieft met de volgende sectie vragen.



## Sectie 2

### Vragenlijst sectie 2

1. Stel je voor dat er in de toekomst ook spraak notificaties komen. Wat zou je daarvan vinden?
2. Waarom heb je die mening?
3. Stel dat de voice assistant jou een aanwijzing geeft (bijv. ga sporten), wat heeft dan je voorkeur? Kort en krachtig of met meer uitleg?
4. Op welke manier kan de voice assistant jou het beste aanspreken in dit geval? Lief, rustig, streng, zakelijk...



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**De tijd voor deze vragenronde zit erop.**

Vervolg alstublieft met de volgende sectie vragen.

## Sectie 3

Dynamic walking meetings  
**Office Vitality**

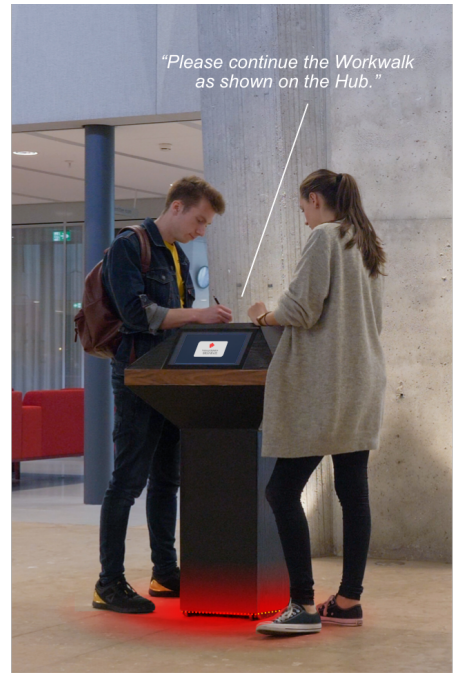
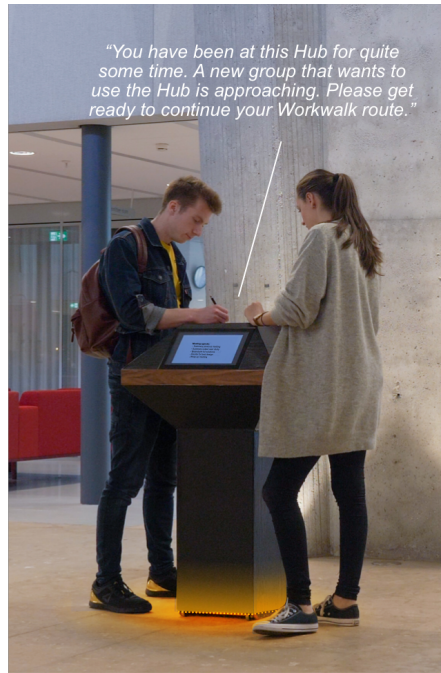


**Nog 1 minuut**

De tijd voor deze sectie zit er bijna op. Rond alstublieft af en vervolg met de volgende sectie.

**De tijd voor deze vragenronde zit erop.**

Vervolg alstublieft met de volgende sectie vragen.



## Appendix V: Script interview experiment

### *Introduction of the user test*

I will first tell you a bit more about the research. At the moment I am working on an individual project in which I am conducting research on the subject of "calm technology". In short, this means that I try to develop products that operate more in the background and only require attention when this is necessary, in order to create more peace in daily life.

Part of my study is feedback from the target group, which you *are part of* in this case. I am currently conducting interviews, in which I first ask participants to answer questions *as presented on the screen* independently. *After that* I will ask additional questions based on the answers *given in the questionnaire section*.

I would like to record this session for analysis purposes. These recordings will only be available to me. All insights will be shared in anonymous form only. Your participation is completely voluntary. You can refuse to participate without giving any reasons and you can stop your participation at any time during the study. You can also withdraw your permission to use your data immediately after completing the study. None of this will have any negative consequences for you whatsoever.

### *Signing the consent form*

#### *Section one, questionnaire guided by designs*

#### *Section two, questionnaire guided by designs*

#### *Section three, interview in current scope*

- What did you think of the test you just went through?
- What are your opinions on the guidance that the system provided? (focus on timing of the message, content of message, way of communicating the message)

#### *Introduce cues one by one, ask questions for each of the cues*

- Did you see this cue?
- What do you think of this cue?

### *Introduction of new scope with the Hub*

Besides the answers you have just given, I am collecting information regarding the so-called Workwalk and Hub. (Show video) The Workwalk is a concept that combines the benefits of walking with the meetings that most office workers have during their workday. Having a walk outside is often seen as a break, but the Workwalk is meant as part of the working day. Instead of having a regular meeting, sitting at a table in a meeting room, we would like to motivate people to have a walk while discussing work related topics. This means you can have a change of scenery during the day, without taking too many breaks and losing productivity. Because some meetings require the possibilities to show slides, make notes or show something on the internet, the Hub was designed. The Hub is a standing table that has screens on four sides, so the participants of the meeting can stand around the table and look at each other while having

the screen in front of them. In this study, I am researching how we can give users cues to nudge them to walk on to the next hub. This is necessary to retain the Workwalk benefits and to manage logistics.

### *Interview with new scope (regarding the Hub)*

- What would you think of the cues you just got presented in the context of the Hub, during a meeting?
- Would it be helpful to receive more information regarding the objective to leave the Hub?
- Imagine going through the questionnaire sections again but with the knowledge you now have. What would you do then?
- Are the cues as presented in this form effective or not?
- Are the cues as presented in this form satisfactory or not?
- Do you have any other suggestions, ideas or feedback on how to give cues that would be both effective and satisfactory?

### *Additional feedback opportunity*

- What did you think of the test?
- Is there anything else I need to know, consider or takeaway? Any other feedback or are there any other thoughts regarding the topic that you would like to share with me?

*The researcher will ask more questions based on the course of the interview. This means that the researcher can ask new questions based on previous answers that are given, or that the researcher can ask extra questions if these occur during the interview.*

## **Appendix VI: Project reflection**

During this first individual project I learned a lot about myself as a researcher, without being influenced by a team member that I could rely on. I am good at creating opportunities and I have definitely become a better researcher over the last couple of months. However, there are a few learning points that unraveled which I think would be important to focus on next semester.

### *Finding the common thread in the big picture*

Over the course of the last couple of months, I have realized that I have the tendency to get overwhelmed with information quite easily. Whether it is feedback, a load of opportunities or a lot of literature related to my project: I get confused when presented with a lot of information. I want to listen to and include everything which makes me get lost in details and what sometimes feels like endless information available. Ironically, I think this perfectly matches my interest for Calm Technology. I realize that it is no wonder that my interest in this subject is so strong!

An example: My strength is to attract opportunities like collaborating with the High Tech Campus. However, when people get enthusiastic and ask me to do XYZ, I get unsure of what to focus on. The same goes for getting feedback from coaches or choosing a direction for my research. During the last semester, I have started to learn how to break up my study into manageable pieces and to really define what I want to research. To narrow it down and get a hold of what insights I will gather. I believe I have made steps in doing so but I also think I need more practice in the last two semesters of my Master track. My research went well, and I think I gained interesting insights that allow for a lot of future research but to be fair, it was by trial and error. Gaining more control of filtering all options available to prevent myself from drowning is therefore a new learning goal of mine.

### *Creating focus in research*

My second learning point ties in with the things discussed previously but also with the learning goals I defined in my Personal Development Plan. I need to learn that I can't study everything. Sometimes, my perfectionism kicks in and makes me want to include everything in my study. This negatively affects the quality of what is being done. I need to gain an awareness of what to include and what to deliberately leave out. Be aware of the pros and cons of decisions: Why am I doing this and what are (potential) problems when I do it like this? From the start of this (pre)master, I have transitioned from a practical way of thinking to a more theoretical, academic way of thinking. Now it is important to get better at this, to practice by repetition and to start positioning myself as a researcher instead of just a student who tries to include all feedback in projects.

### *Future career*

During this semester, I have very consciously kept an eye on what I want to do in the future. What work do I want to do and what do I need to learn in preparation? The focus groups I organized are a very good example of this. These were not

only very relevant to the project, but also to my personal development because I noticed that focus groups are used a lot within companies.

Because I already work as a videographer, designer and marketer part-time, I have close connections to the work field. Based on what I see and do there and talks I have had with my boss and colleagues, I know that the learning points described in this reflection not only apply to research, but also to the work I am already doing. When it gets busy with a lot of tasks, I tend to skip steps to finish tasks without taking a step back and reflecting on what I am actually doing. Asking myself where the priorities lie and what consequences each of my choices have is something also my work can benefit from!

### *M2.1. project*

Luckily, I already have plans for the upcoming semester. Although the collaboration with the High Tech Campus was on the back burner this semester, I have kept contact with them. This means we are now working on a concrete plan of what we want to do and how I can incorporate my learning goals into the project. Aligning all wishes, needs and possibilities will be a big task, but I am definitely looking forward to this challenge!