

Ambient Office

Final Bachelor Project

Designing for Growing Systems in the Home

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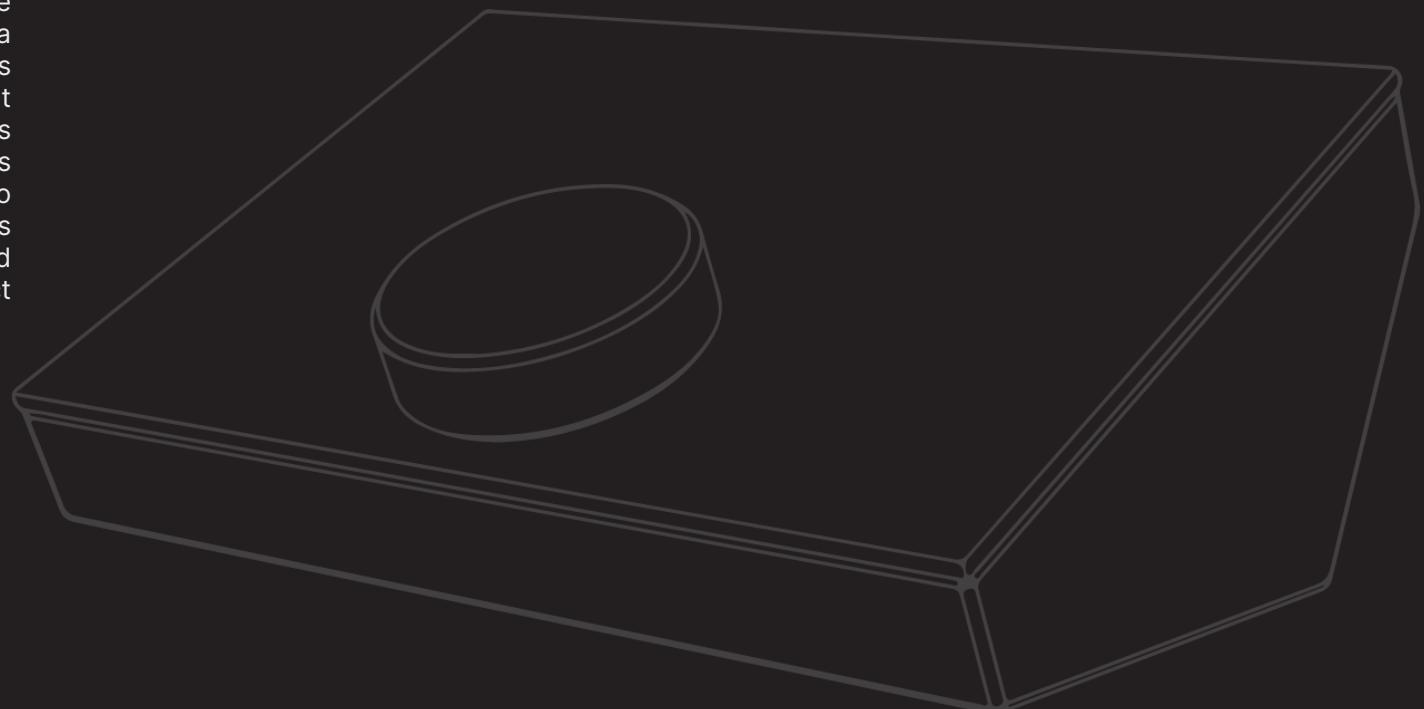
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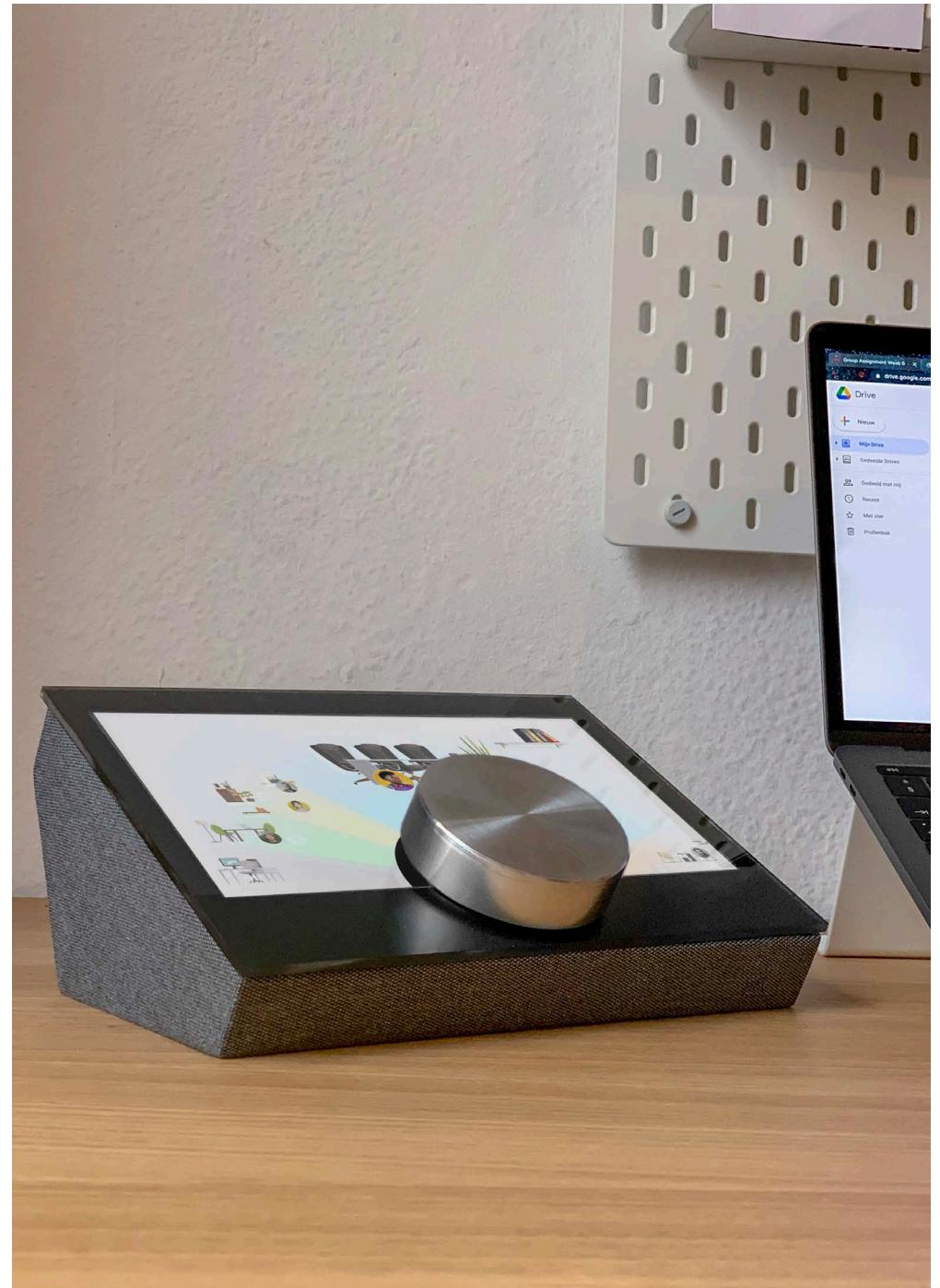
Summary

This report describes my final bachelor project within the squad Designing for Growing Systems in the Home. The project is an exploration of the future of connectivity among remote workers in a smart home context. The goal of this project has been to design a product, service or system that enriches the home work experience and prevents loneliness. The result of this design project is Ambient Office, a product that helps coworkers to connect and enhances the feeling of inclusiveness through ambient sounds. This report shows and elaborates the process towards this final product and evaluates the outcome.



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Prologue

The origin of Ambient Office

I believe design can connect people, to each other and knowledge.

Design and technology remove boundaries. I chose the Designing for Growing Systems in the Home squad because it narrowly aligns with my interest in creating and enriching connections through design. Besides, the focus on rich interaction [5], IoT and physical prototyping are in line with my interest and way of working.

I chose the topic of flexible home (work/leisure) experience as I envision a future where the home and its smart technologies become more and more integrated into our daily lives, our routines and our workflows. I found this topic especially interesting considering the current pandemic, the problems that are arising and the creativity that people show to deal with the emerging phenomenon called home working.

Designing around an IoT Sandbox, a smart home in 2030 with a fictional household, is unquestionably appealing to me. I enjoy thinking analytical, keeping in mind everything that happens in and around the house and contributing to the wellbeing of the inhabitants. Also, the cooperation that comes with it, collaborate with fellow students to align the concepts, explore future scenarios and prototype the IoT system.

You will see throughout this report the focus on experience prototyping and how it contributes to my design process. Designing a product, service or system which is tailored for growing systems and prototyping such technologies is one of my favourite parts of design.



Introduction

Problem statement

As our daily lives become more and more filled with smart technologies, possibilities become infinite; we can have video calls with people on the other side of the world, we can adjust all the smart appliances in our house with an app and we can work together remotely. Remotely? Yes, in theory, we have all the tools; we can (video) call one another or even multiple people, work together in shared documents, have a shared whiteboard and to-do list and that all from the comfort of your own couch.

Even though it is currently opposed on many by the pandemic, it was and is becoming more and more standard for people to work remotely [8]. You save time and resources by not commuting, you are much more flexible and can have lunch with your family.

Unfortunately, there are some major downsides of working from home. People lose the unplanned watercooler or cappuccino conversations with colleagues in remote work. These are actually big and important parts of the workday that have a direct impact on performance [9]. Loneliness is one of the most common complaints about remote work, with employees missing the informal social interaction of an office setting. (...) However, over a longer period of time, isolation can cause any employee to feel less "belonging" to their organization, and can even result in increased intention to leave the company. [7]

In this report, I elaborate on the process of me designing for social inclusion among remote workers. I am designing for Neil, part of the fictional household that lives in the IoT sandbox, a house which is used as a tool to explore and prototype how all the concepts of everyone in the project squad come together in the smart home of 2030.

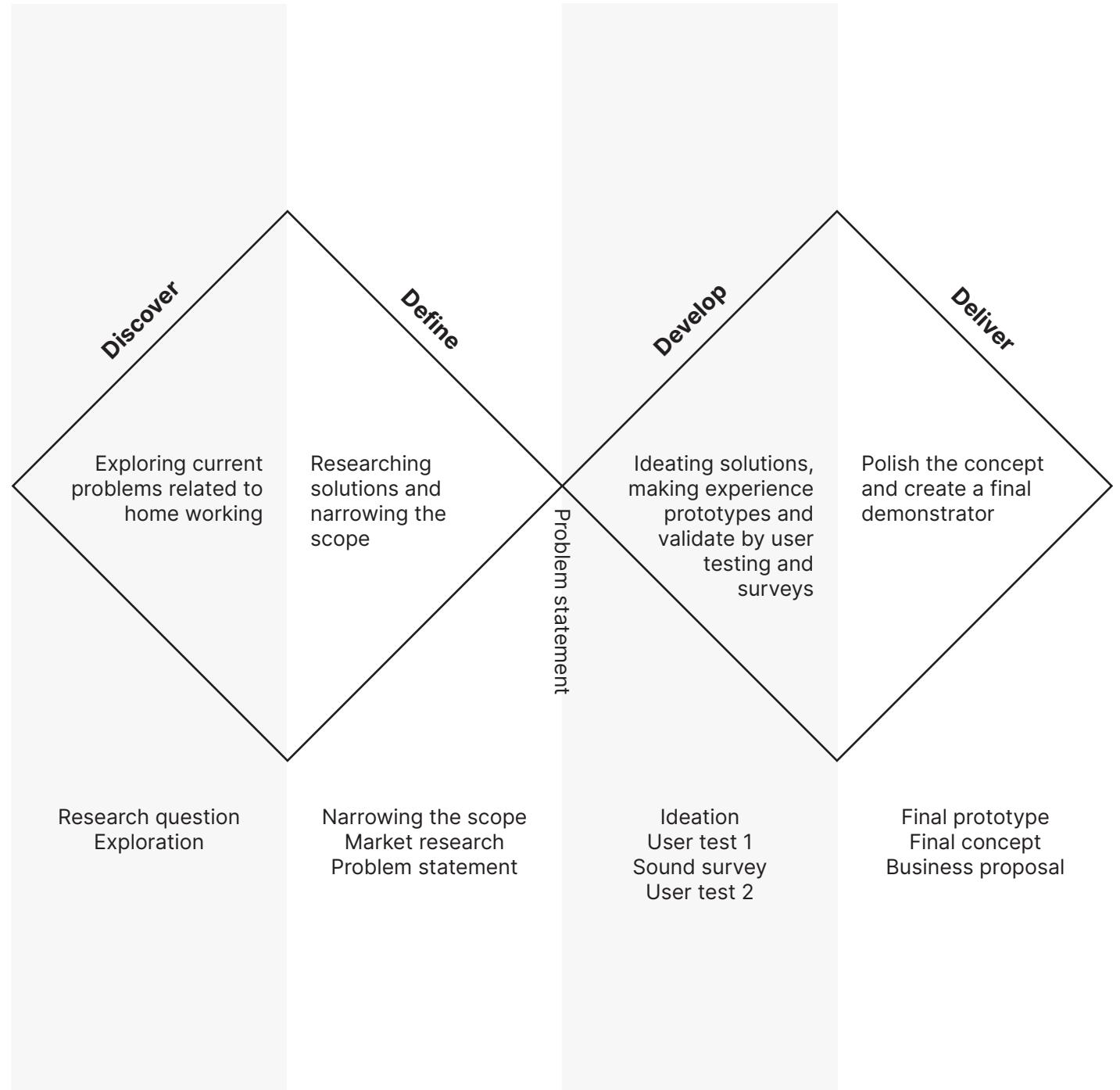
Throughout my bachelor, I have discovered that my passion within design is on connecting people using technology as a means. Therefore I decided to design for the topic home (work/leisure) experience as I see many design opportunities in the connectivity among home workers. My goals were to create a rich digital-physical hybrid product which contributed to the wellbeing and productivity of home working individuals.



Process

Double diamond

To structure and guide the design process, I made use of the Double Diamond Process [11]. To me, this model gives structure and makes it easier to identify and communicate in what stage of the design process I am.



Discover

Research question

How can design and technology play a role in enriching the home working experience?

Exploration

I started by exploring the current rituals and activities related to working and leisure in the home and the transition in between. Problems I identified were the transition from home working to home relaxing which is not supported by the digital tools we use.

Also, the way we start an informal conversation in the physical office is not at all similar to how we start it digitally. Instead of walking to someone's desk or joining the coffee break, we have to press a button on our laptop and call someone, not knowing whether they are open for it or what they are doing.

Define

Narrowing the scope

The transition from work to home is definitely an interesting topic but through the research, the loneliness among home workers appeared to be a more significant problem.

"People lose the unplanned watercooler or cappuccino conversations with colleagues in remote work. These are actually big and important parts of the workday that have a direct impact on performance." (Neeley, 2020) [9]

Besides the impact on performance, the feeling of belonging seems to decrease if employees are not having informal social interaction with each other. "Loneliness is one of the most common complaints about remote work, with employees missing the informal social interaction of an office setting. (...) However, over a longer period of time, isolation can cause any employee to feel less "belonging" to their organization, and can even result in increased intention to leave the company." (Larson et al, 2020) [7].

"Once the pandemic-related lockdowns are over, many people will continue working remotely. Those who return to the office will need to work in ways that are compatible with their remotely working associates." (Limoncelli, 2020) [8].

To conclude, the essence of the problem I am focussing on is improving social cohesion among people who are working from home.

Market research

The current tools used to connect remote workers were analyzed such as Microsoft Teams, Slack and Discord. The systems all seem to fail at one thing; giving employees a feeling of inclusiveness when using the platform. Of course, they all allow the user to make calls, join conferences and see if someone is online but they do this in a way which is not inclusive, comforting or cosy.

Spatial Chat was inspected, a paid platform which allows the users to walk around in a digital space and start a conversation with people surrounding them. Numerous positive feedback shows how the platform brings back the "walking" through a space people are used to; to be able to start a conversation with the person next to you without occupying the whole conference call. Still, this platform was missing a link to the work floor and lack of showing availability.

Lastly, Mobile Remote Presence technologies were researched and the benefits of remote physical mobility were used as an inspiration for digital spatial presence [2].

Problem statement

I defined the following problem statement;
Enhance (informal) social interaction between remote workers to increase inclusiveness and productivity at home.

Together with the problem statement, I defined essential values to keep in mind throughout the design process; Inclusive, open and non-invasive. These kept coming back during the research and were used as a frame to design with.

Develop

Ideation

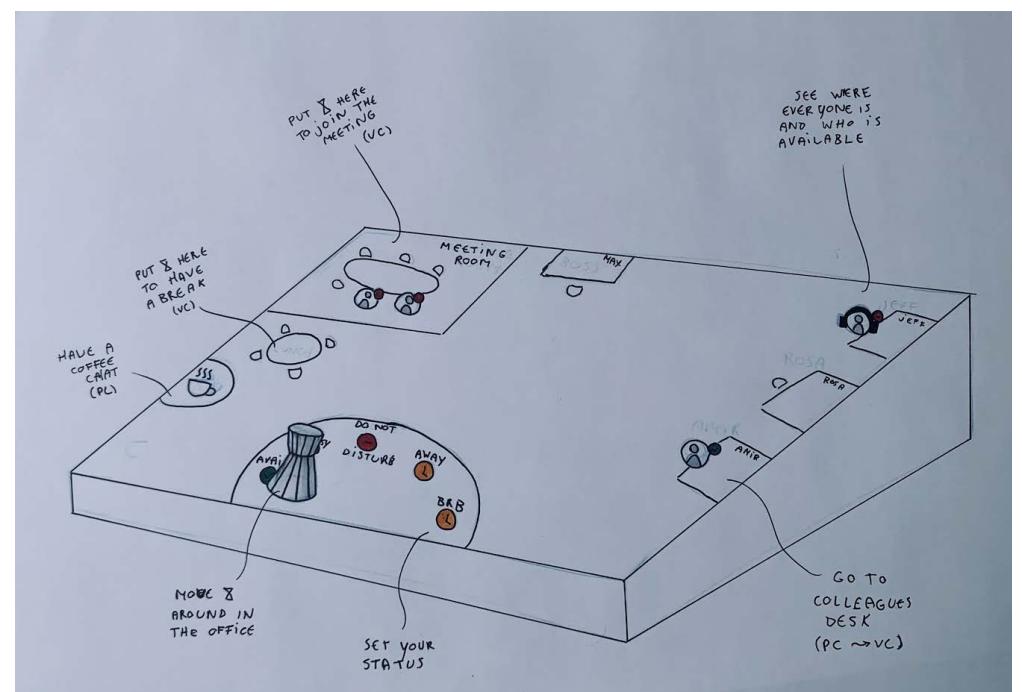
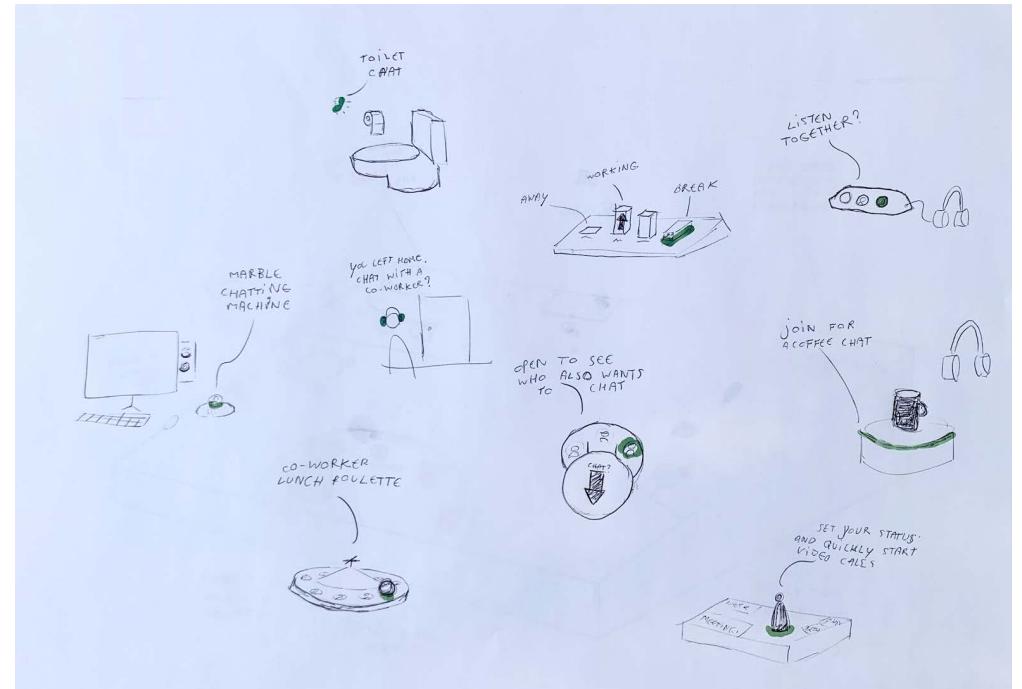
The ideation phase was started by brainstorming about various rituals in which social interaction with colleagues could be integrated or enhanced. A few examples from the brainstorm were a coffee mug experience which invites and links coworkers to have a digital coffee break together, a shared music listening experience which provides multi-user input to be a conversation starter and lastly a coworker lunch chat roulette.

First concept

The most interesting concept from the ideation phase was an interactive board on which the user places a pawn to show its availability to its coworkers. The concept was to simplify digital remote presence and remove the quirkiness and inconvenience of physical office robots but keeping the spatial presence and the aim for lower threshold communication.

The display shows a map of an office and all the coworkers at their desks, at the lunch area, at the coffee machine or at the meeting room. The pawn can be used to start the classic desk or coffee machine conversations by simply placing it there. The pawn, in its initial state, is placed on a dock where it sits on the availability of the user, for example Busy.

An assumption was made that a visual overview of the office and its coworkers would enhance the feeling of inclusion.



UI explorations

Circular displays were explored to create a vibrant and interesting interface. The map was transitioned into a more dynamic overview of the colleagues. Colours were used to indicate availability of the coworkers and the location of their pawn would be shown on the user's display (Fig. 01).

Using the pawn to indicate availability felt awkward and unnatural, more intuitive ways of showing openness were explored such as a valve. The valve is used to open or close the space between the user and the coworkers (Fig. 02).

A feature to leave the office completely should be integrated to accompany the mental transition home. A slider was created so that the dock of the pawn would completely slide out of the office which would remove the user from the digital space (Fig. 03).

The slide functionality felt intuitive and the idea came up to use the physical slider, which is a representation of the user in the digital office, to literally walk through the office. The slider track was extended to completely move from the top to the bottom of the digital office. Instead of the pawn, now the slider would initiate calls with colleagues by sliding it to the same height as the colleagues. Rotating the sliding dial changes the availability instead of the valve. A simpler coloured stroke was added around the dial to provide the user feedback what availability currently is selected. The position of the slider is linked to the openness of the user for conversation, completely down means the user is not open at all and the interface is dimmed, halfway means open for chat and all the way to the top would join a meeting room where a conference video call is with everyone present (Fig. 04).

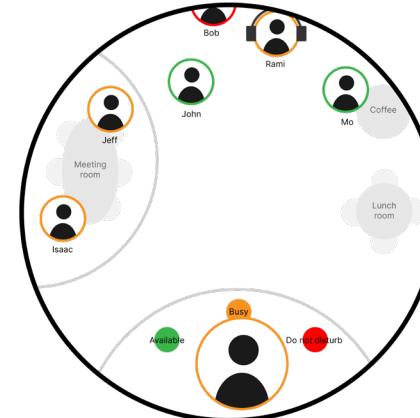


Figure 01 | Circulare UI

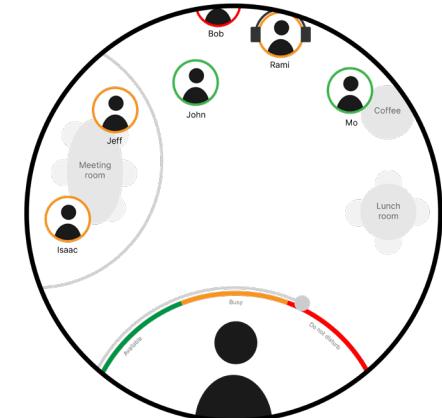


Figure 02 | Valve openness

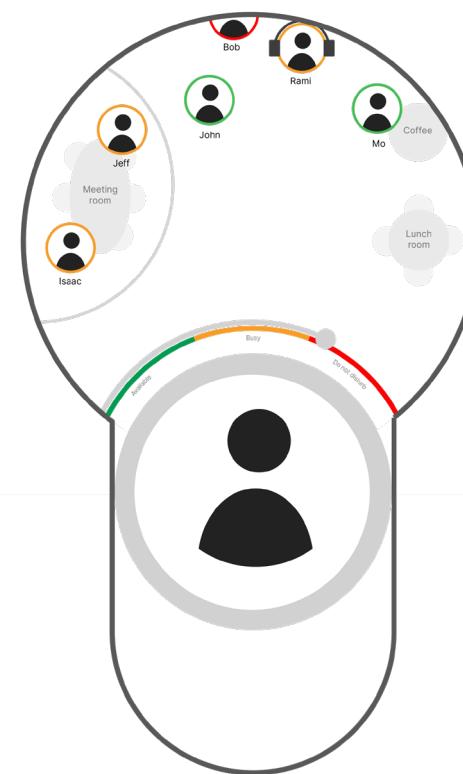


Figure 03 | Slide out

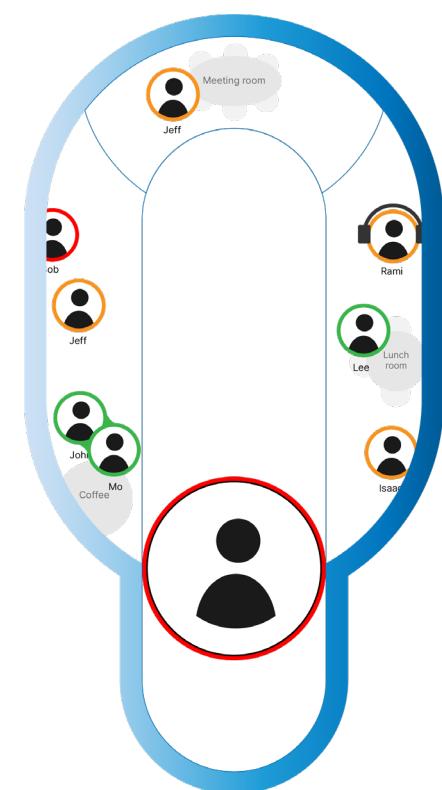


Figure 04 | Slide through

Physical mockup

A quick physical mockup was created to explore the interactions and functionality of the prototype. The glass cup represents the dial and gave insights into what dimensions are preferable for such a sliding dial. The small magnets represent coworkers, these are placed throughout the office. These would best be digital as their position changes continuously (Fig. 05).

"Experiencing real interactions opens up the full richness of such real interactions." (Ross et al, 2010, p. 12) [10].

The interactions were pleasant and felt intuitive and an interactive prototype should be created to further verify the interface.



Figure 05 | Lo-fi tangible interaction exploration

Digital mockup

A Processing sketch was made to prototype the interaction of calling a coworker and moving around in the office. When the dial is on the same height, the coworker floats towards the dial and starts a conversation. Overlapping bubbles mean that those coworkers are having a conversation. Sliding to the bottom dims the screen and represents the transition out of the office (Fig. 06).

The coloured strokes were unsuitable to indicate availability, not only is a fair amount of humanity colourblind, colour is not how office workers show their availability in the physical office. A transition was made towards a more representative indicator; size, coworkers would move to the side and shrink indicating they don't want to be bothered (Fig. 07).

A 3D view of the concept so far was created to communicate what parts would be digital and what parts physical (Fig. 08).

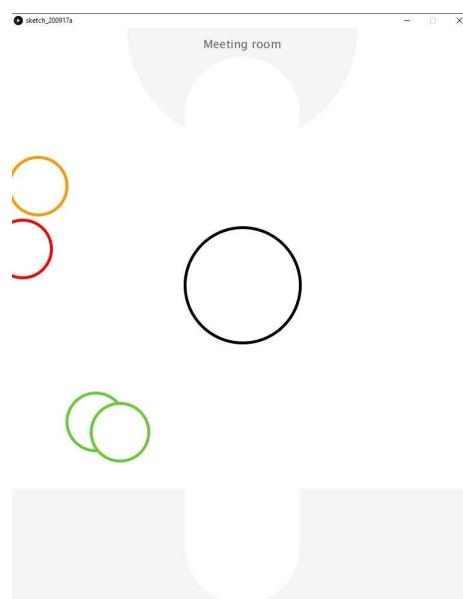


Figure 06 | Processing calling exploration

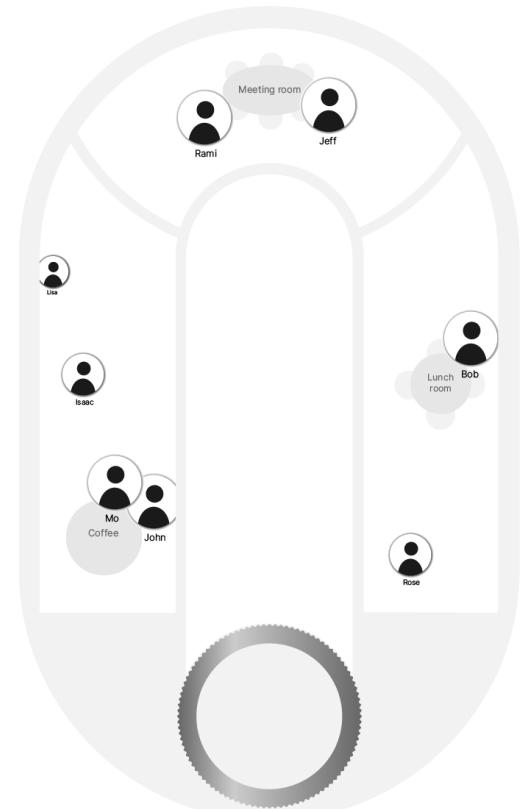


Figure 07 | Size and and distance as indication for availability

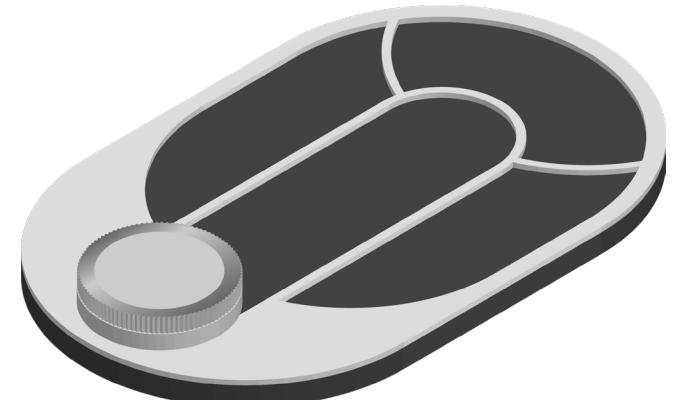


Figure 08 | 3D visual

Sound design

Besides the size of the coworkers, sound was explored as a means to communicate information about the office. An ambient sound depending on the coworkers' location and availability would let the user hear what's going on around him and provide a more vibrant interface. For example, if someone is at the coffee machine, a subtle coffee grounding is played through the background noise and the user can hook into this if he wants to. Another benefit of such soundscape is that the user is hearing its coworkers and therefore might feel more connected. Fictional sounds for the soundscape were chosen as the product should be as non-invasive as possible.

Interaction design research

The use of sound to communicate information is not new so research was done in the field of soundscapes. Interesting insights were; "we tend to only hear and act upon sounds that are relevant to us and we easily ignore sounds that are irrelevant and do not require immediate action" (Eggen et al, 2016, p. 240) [4]. This fits the aim of the product, the subtle coffee groundings would not disturb the user if he is focussed and does not want to have a break, and the other way around, if he is feeling like a break, the coffee noise will not be left unnoticed.

This is strongly in line with the Interaction Attention Continuum (Fig. 10) which states "when more precise control is needed, more focus is required and the interaction will shift along the interaction-attention continuum from being peripheral towards being focused" (Bakker et al, 2016, p. 10) [1]. This means that if the user wants to make a call with a specific coworker, a focussed interaction with precise controls is needed, such as moving the dial to a specific location. But when the user is subconsciously annoyed by the product and wants to quickly shut off the sounds, he can easily move the slider down without even looking at the screen.

To validate what parts of the design are physical and what parts digital, I looked at the Physical interaction in a dematerialized world, which states that static parts of the interface should be physical and dynamic parts digital [3]. Physical parts can be temporarily digitized to create a more coherent interface. This was implemented by dematerializing the dial when a conversation is initiated, then a digital representation of the dial would join the conversation in the digital office space (Fig. 09).

Lastly, research was done on a more holistic level to gain a better understanding the role of design when users are using a system together; "An aesthetic of being together is a proposition of a different fundament for interaction design practice. In addition to referring to properties of things and qualities of interacting with things, it refers to the kind of relations that come to expression between people interacting with each other with these things." (Keunen, 2018, p. 7) [6].



Figure 09 | Dematerialization of the dial

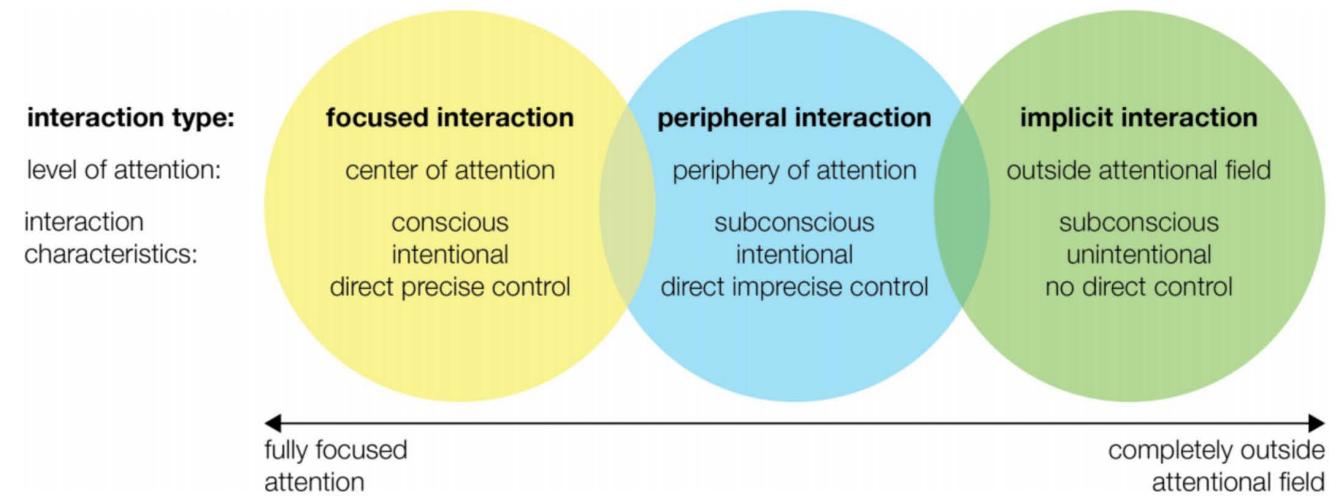


Figure 10 | Interaction Attention Continuum [1]

Digital mockup 2

To implement and explore the soundscape, a more advanced interface was prototyped using HTML, CSS and JavaScript. In this prototype, not only was the soundscape explored but also interface sounds to accompany the various interactions with the product such as joining the meeting room, leaving the office or starting a call (Fig. 11).

The ambient sound would change according to how many people are in the office, how many are in the lounge and the availability of the user.

In this mockup also the varying size of the coworkers is incorporated and evaluated. The time it would take to start a call with a less available coworker is longer than a person more available, they are further to the side and therefore take longer to start the call.

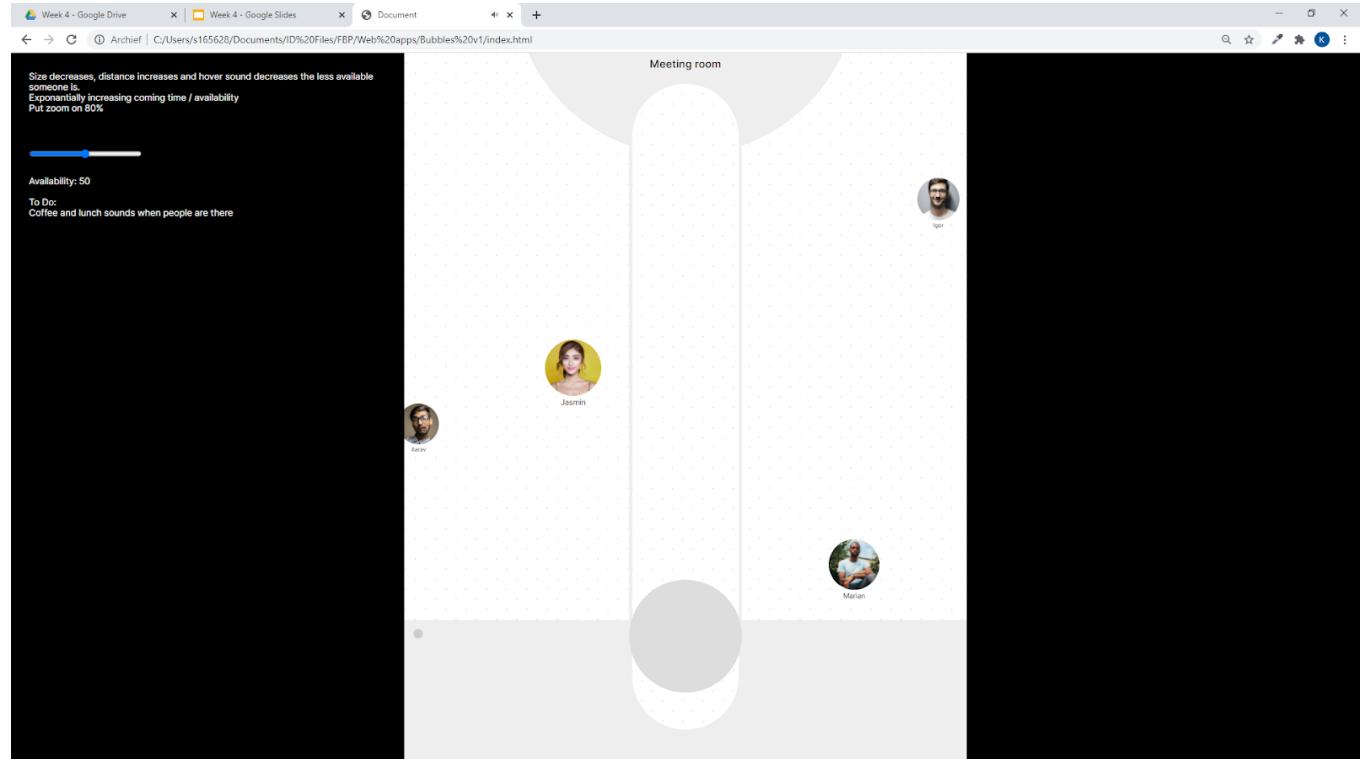


Figure 11 | Interactive soundscape prototype

Physical mockup 2

To accompany the digital part of the interface, a second physical mockup was made to explore the interaction with the digital-physical hybrid.

A laser-cut (Fig. 13) was made to create the part laying on top of the screen and the sliding dial. The initial plan was to use a magnet inside of the rotating part of the sliding dial and use magnet sensors to identify the location and orientation of the dial (Fig. 12). These magnet sensors can identify where a magnet is located and how far away, like a compass (Fig. 14).

Unfortunately, the angle was too imprecise for the range of about 25cm that the dial would slide (Fig. 15). Also, if for example, a laptop is closer than the dial to the sensor then it would sense the magnet of the laptop's speaker and create a lot of noise.

Secondly, a hall sensor was tested which senses only the strength of a magnetic field (Fig. 16). An array of these along the sides of the track would be able to provide enough data points to identify the position and orientation of the sliding dial (Fig. 17). After testing the range of the hall sensor, it turned out to be around 4-5cm and would mean a sensor should be placed around every 3cm on both sides of the track of the slider which would translate to around 40 sensors. At this point in the design process creating such an elaborate circuit was out of scope so I decided to look at easier alternatives to identify the location of the sliding dial on the screen.

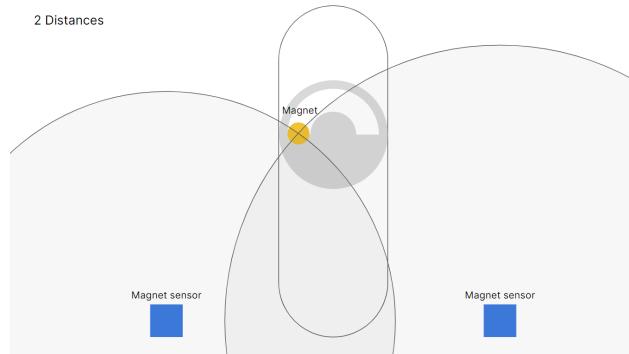


Figure 12 | Magnet sensors position detection



Figure 13 | Laser cut front

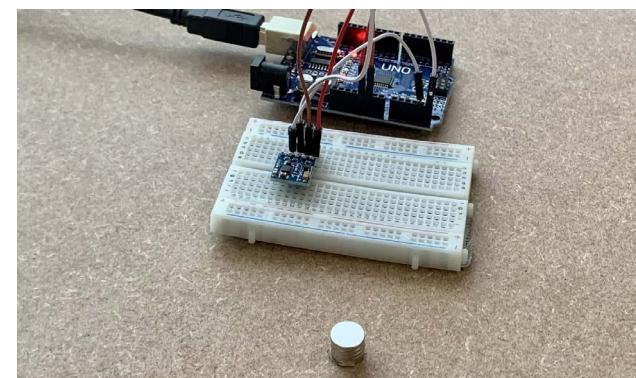


Figure 14 | Magnet sensor

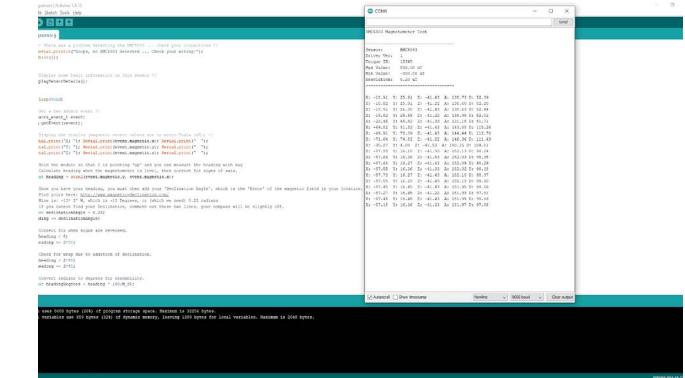


Figure 15 | Reading values in Serial monitor

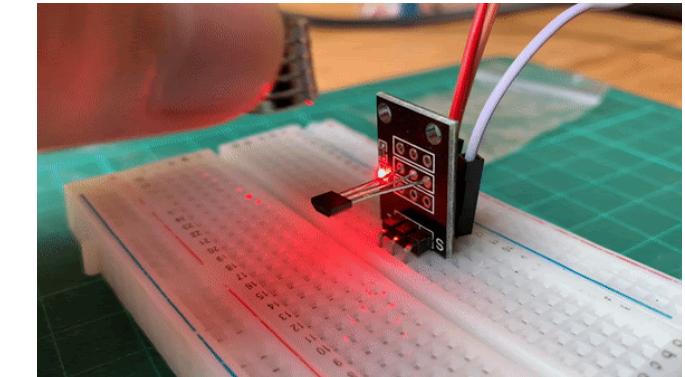


Figure 16 | Hall sensor threshold testing

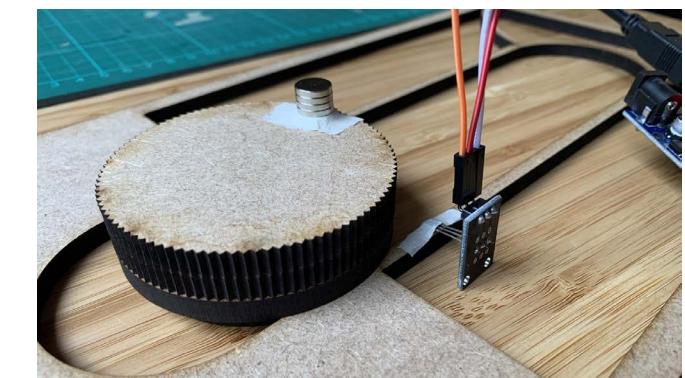


Figure 17 | Hall sensor magnet detection

Touch monitor

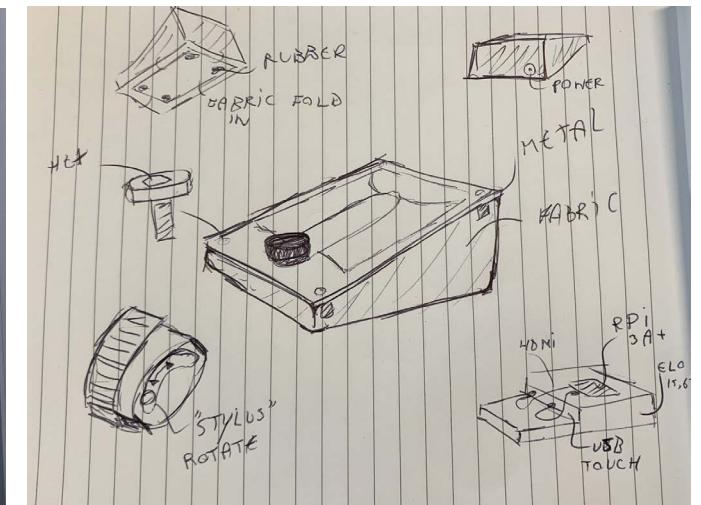
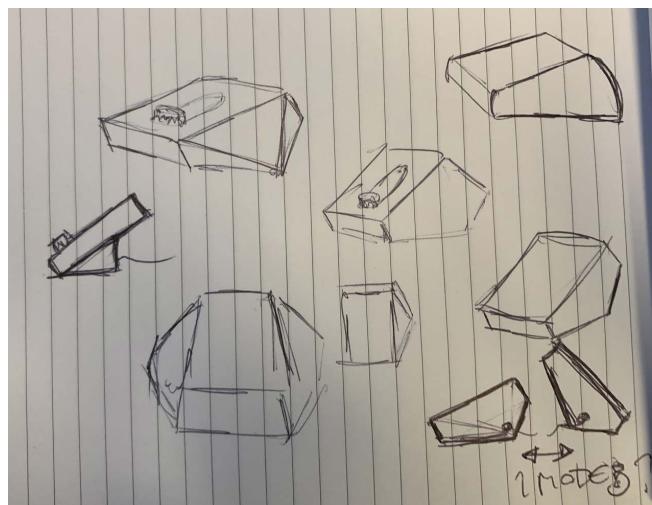
A touch screen was tested to evaluate whether it was suitable to identify the position and orientation of the sliding dial. Two ELO (ET1541L) touch monitors for the experience prototypes were bought, although much more expensive than the magnet sensors, hopefully suitable for the purpose.

A touchpoint on the bottom of the slider which rotates with the dial is used as a mouse input for the touch monitor. In processing, using the distance of the X value of the mouse input to the X value of the centre and the mouse Y value, the position and orientation can be calculated using the cosine. This way with only one touch input the position and orientation can be calculated.

An MDF enclosure was created to put the touch screen in (Fig. 18). An angle of 30 degrees was chosen as this seemed to be easy to view and comfortable for the arm to slide along. Although the screen was much bigger than needed, it was sufficient for testing the graphical user interface.



Figure 18 | Touch monitor in enclosure running processing



User test 1

Goal

The goal of the user test was to identify problems with the digital interface, validate functionalities and evaluate behaviour using the product.

Setup

A web version of the product was made using JavaScript and the OOCSI Websocket to run the application in the browser on the touch monitors. The web applications communicate the position and availability of the user to each other so the prototypes can be placed at the participants home (Fig. 19). Using the interface on the touch screen, the participants could initiate a video call with each other or with me and join a conference call in Microsoft Teams. According to what the other remote workers were doing, the visual overview and the ambient sound changed.

Deployment

The two prototypes were deployed at two fellow students, I acted as a third participant in the digital office space through my laptop. Two fellow students were chosen as they have an informal relationship with me and with each other and we often work together on the university. As I was part of the deployment, I could observe their behaviour closely.

The prototype was deployed for one full workday after which a thorough interview was held and insights were shared.

Insights user test 1

The visual overview felt comforting and as an easy conversation starter;

A: "Hey I taught you were going to do sports this morning?"

B: "No I did not go because of my knee"

A: "Oh too bad, what about your knee?"

B: ...

As you know whether the coworker is available and open, the threshold felt lower to start a video call. Usually, you just gamble whether someone is going to pick or not. Often calling is only used for formal topics throughout the working day, seeing that someone is in the lounge made it low threshold and natural to join and start a chat.

Movement on the visual overview in combination with the changing sound was quickly noticed and gave the participants a pleasant feeling. *"It felt vibrant and comforting to see others move around, it feels like I was among them"*. The ambient sound also replaced music, the participants found the office noises to be pleasant and did not feel the need to play music to fill the quietness.

The participants were noticing a strong overlap in availability and openness and used them interchangeably. For example, moved the slider down if they were in a meeting or changed their availability to show they were open for a chat. The two analogue inputs were overlapping and a more concrete availability or different zones were preferred such as Busy, Available, In a meeting etcetera.

It was noticed that more than 3 participants would be better to test a platform like this, when me and the other participant left for lunch, the third participant was left feeling lonely in an empty digital office.

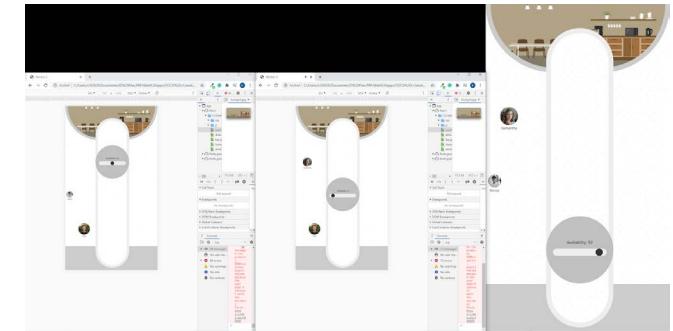


Figure 19 | Three web apps communication with each other



Midterm

At this point, a video was created to communicate the concept so far (Appendix). The process was evaluated and a plan was made for the second semester. A sound survey should be made to further explore and validate the soundscape and its efficiency to transfer information. Alongside that, an app version of the product should be made to test the concept remotely with multiple people without disobeying the Covid guidelines.

A company to deploy the app was needed and I came upon Briks, a company providing fire safety advice to companies and municipalities. As they were all working remotely due to the pandemic, they were a perfect fit for my user test. First I discussed the concept with the CEO of the company and he immediately gave insights from his perspective, he wanted to make sure his employees did not feel micromanaged or intruded by the product. I was confronted again with the importance of privacy and explained that only fictional sounds were used, no recordings were made and the video calling is the same as their current system, Microsoft Teams. He also confirmed that they really miss the informal social interaction and that online informal events such as online Friday drinks were not fulfilling.



Sound survey

Goal

The goal of the sound survey was to identify the effectiveness of varying soundscapes, explore what data can be communicated through sound and how people feel about various soundscapes.

Setup

Four different soundscapes were created using office sounds from an Office Noise Generator [16]. Four extremes were made to test how far the soundscapes could be pushed in communicating information; a completely full office, a completely empty office, everyone present in the lounge and everyone doing focussed work. The participants of the questionnaire were asked to listen to the soundscapes and explain how many colleagues they thought were present, what the colleagues are doing and how they experience the atmosphere of the soundscape (Fig. 20). Links to the sounds and survey responses can be found in the Appendix.

Insights

The main insights from the 10 responses of the sound survey were that people quickly felt overloaded with sounds, soundscapes with more than 4 different sounds or loud chatting were chaotic. I was confronted with the fact that I cannot just keep adding sounds to the soundscape when more people are around. There is a certain overload when the sounds become indistinguishable. This was taken into account and the parameters of the sound levels of the digital prototype were adjusted to match the maxima.

The different atmospheres communicated through the sounds were mostly correct, people were able to identify what I intended them to hear.

Figure 20 | Questionnaire screenshot

User test 2

Goal

The goal of the second user test was to validate the digital interface and soundscape and evaluate behaviour of multiple people using the system.

Setup

To test the product with many remote workers, an app was constructed. Figma was used to create an interactive prototype of what the app was going to look like (Fig. 21). I replaced the analogue openness slider with a dropdown menu to indicate availability. Sliding up and down represents openness and this time initiating a call with someone would again call them on Microsoft Teams, sliding to the top joins a conference call and sliding to the bottom leaves the office, dims the interface and fades out the sound.

The application runs on the mobile phone of the office workers so they can put it beside their workstation monitor. A second application would run on the workstation and play the sounds and launch the video calls in Microsoft Teams.

The concept was presented to the employees of the company and 6 workers participated to test the system for a full workday. The code was tailored to the amount of coworkers, their profile pictures were implemented in the interface and their emails in the backend to start the video calls with each other. A manual was sent before the deployment so they could properly set up their workstation to function seamlessly with the mobile app, the sounds and the conference call (Appendix).

The deployment prototype and manual were made using Dutch language because the office workers were native Dutch speakers and language should not be a threshold for understanding and using the system.

In the following screenshots, the profile pictures are replaced with stock pictures due to privacy.

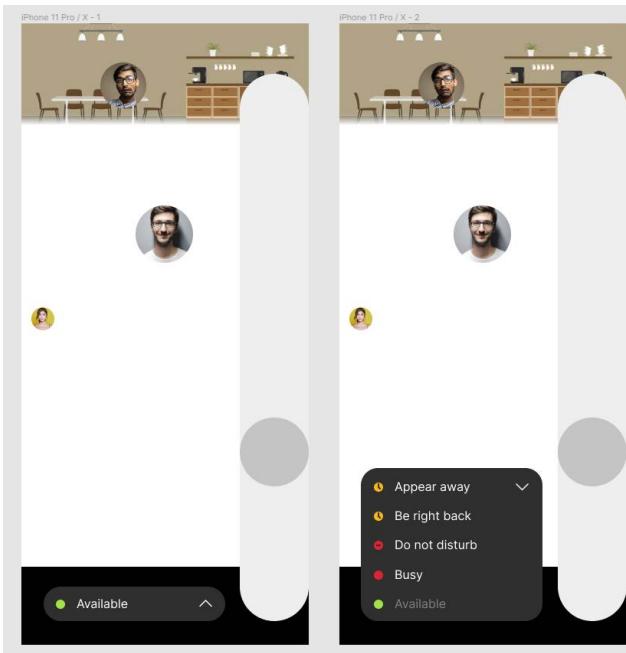


Figure 21 | Figma screenshot

Coding

Programming was done completely by hand in Microsoft Visual Studio Code (Fig. 22). The WebSocket functionality from OOCSI was used again to connect the smartphones of the remote workers to each other and to their desktop application. An example of two communicating devices is shown in figure 23. As you can see, their status and position is communicated.

Figure 22 | Microsoft Visual Studio Code

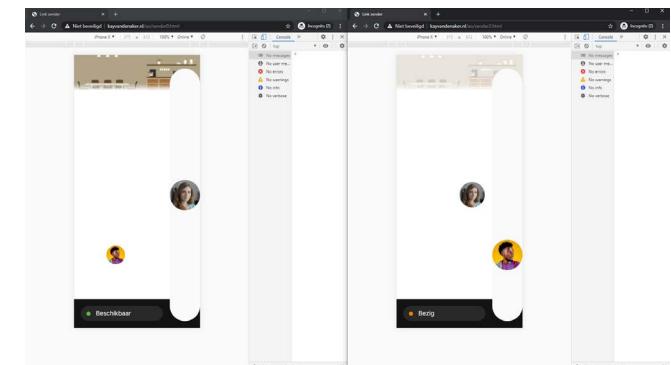
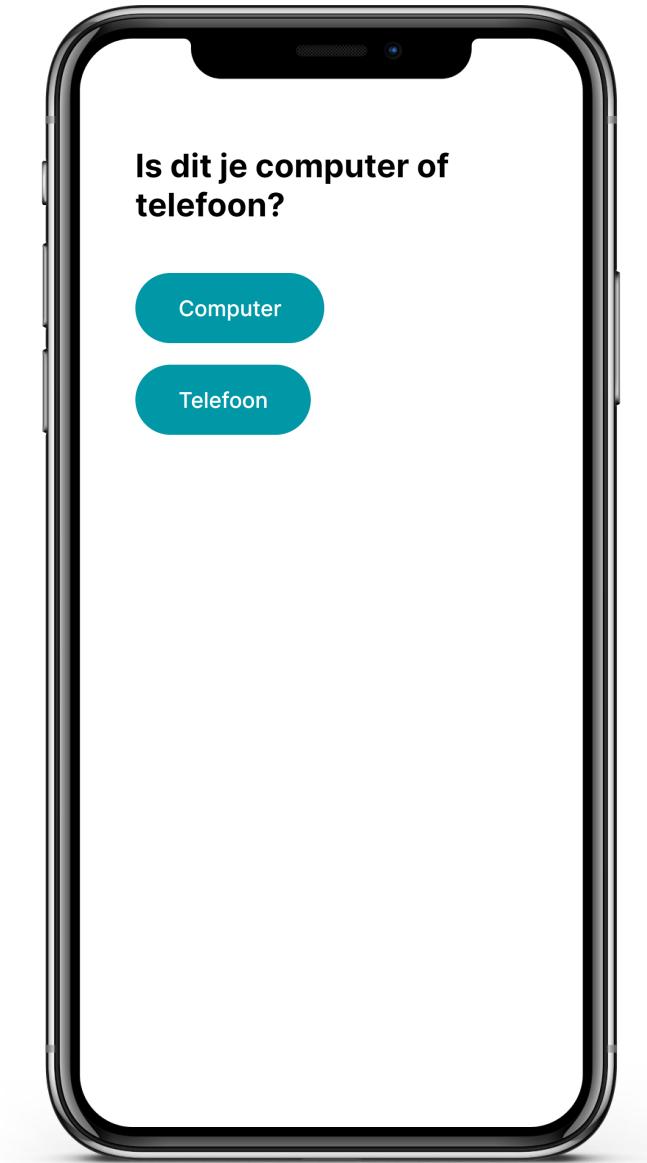
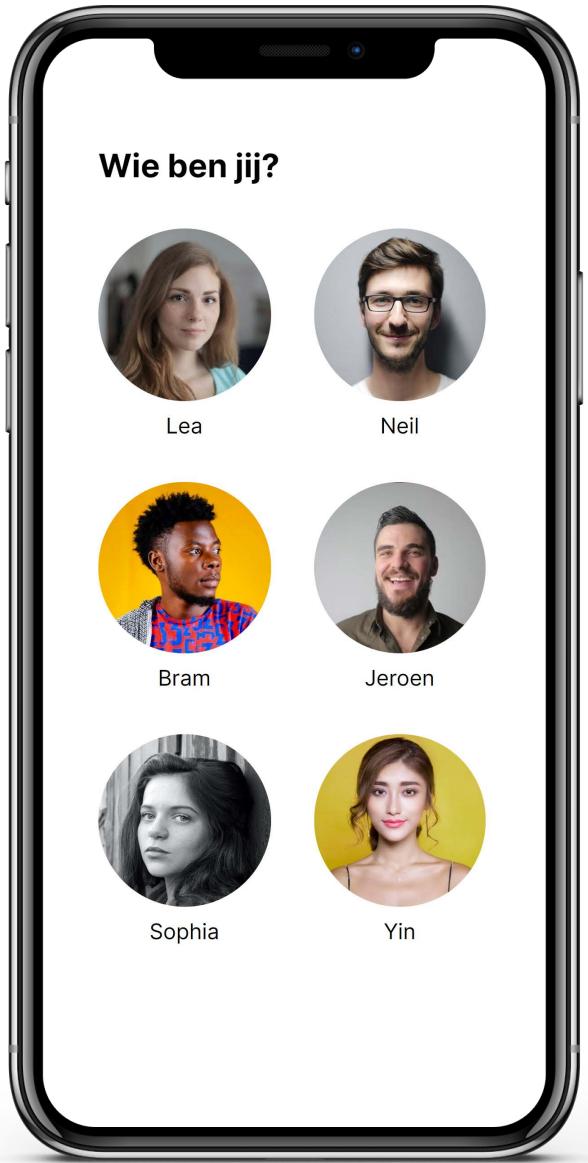


Figure 23 | Two application communicating through OQCSI



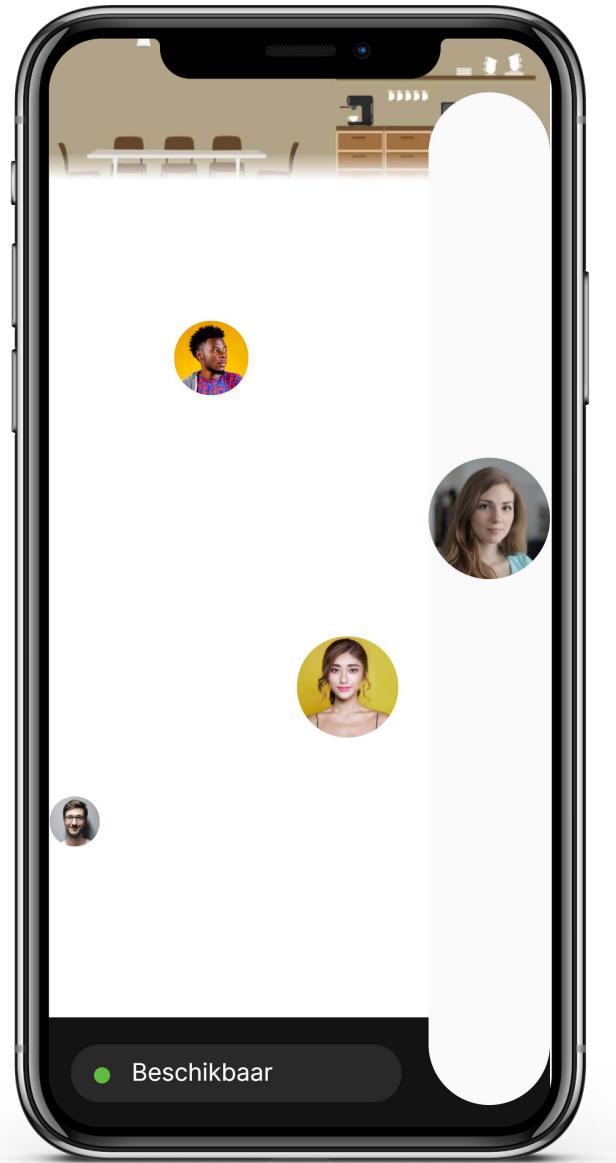
Start screen

The start screen of the application prompts whether this is the user's mobile or desktop device.



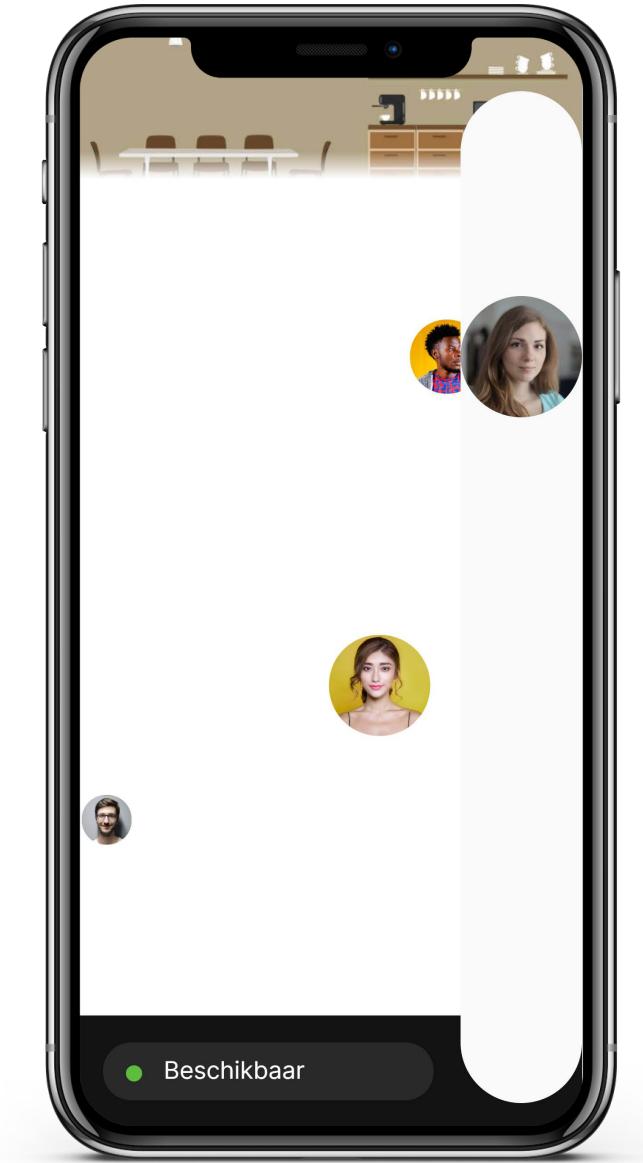
Identification

The user is then asked to identify himself.



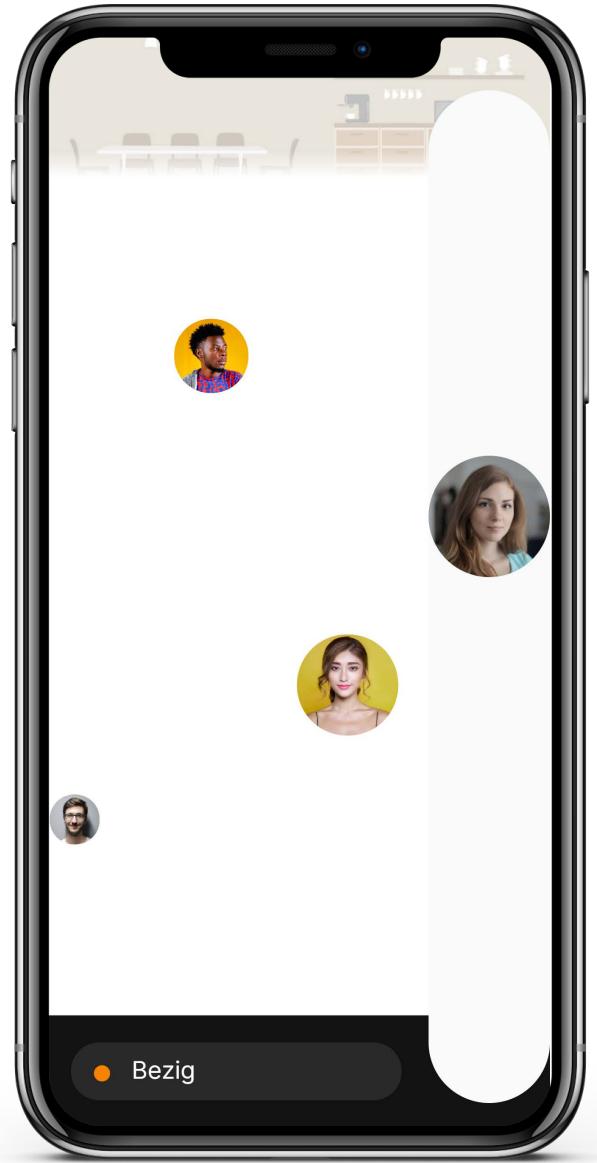
Initial state

The user joined the ambient office and can now see which coworkers are also working from home and what their availability and openness is. The ambient sound starts to play.



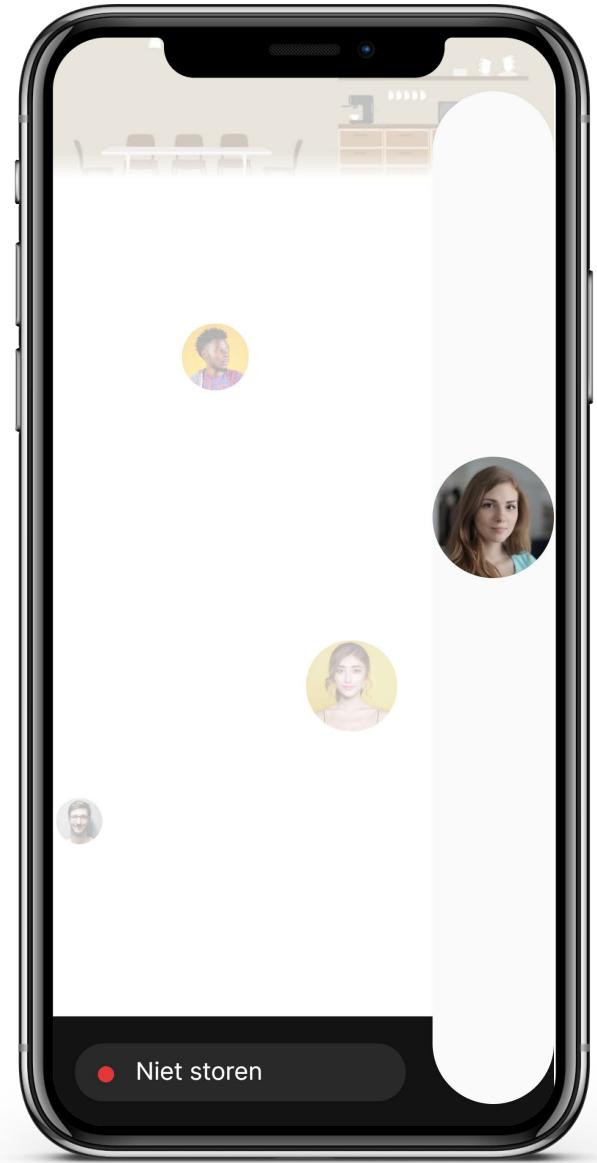
Calling

If the slider is moved to the same height as a coworker, the profile picture floats towards the slider and a call is initiated on the desktop of the user.



Busy

The user can change his status using the dropdown menu, if the status is set to "Busy", the lounge at the top fades out together with the ambient sound coming from there.



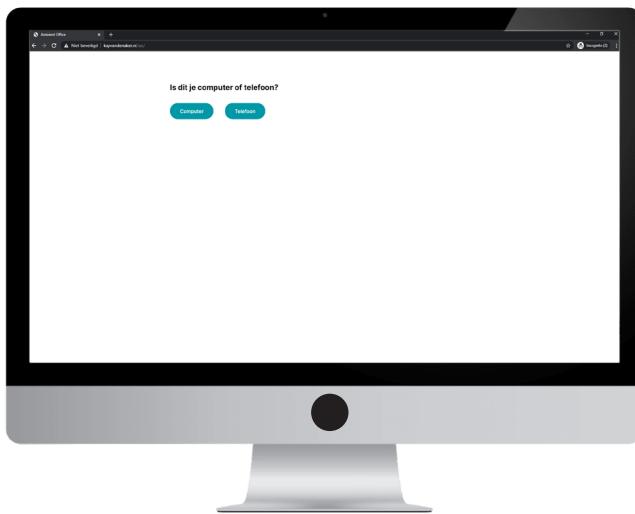
Do not disturb

If the status is set to "Do not disturb", the lounge and the coworkers fade out and all the ambient sound is dimmed.

Desktop application

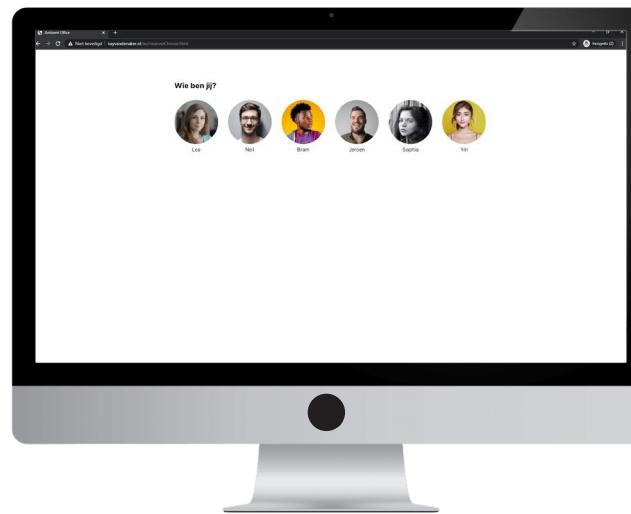
The desktop application is open in the browser of the user. This application communicates with the mobile application and opens Microsoft Teams when a call is initiated or the conference call is joined on the phone.

It looks at the availability and position of the coworkers to play a tailored soundscape through the speakers of the desktop. The ambient sound is played from the desktop application as the computer (often) has better quality speakers than the phone.



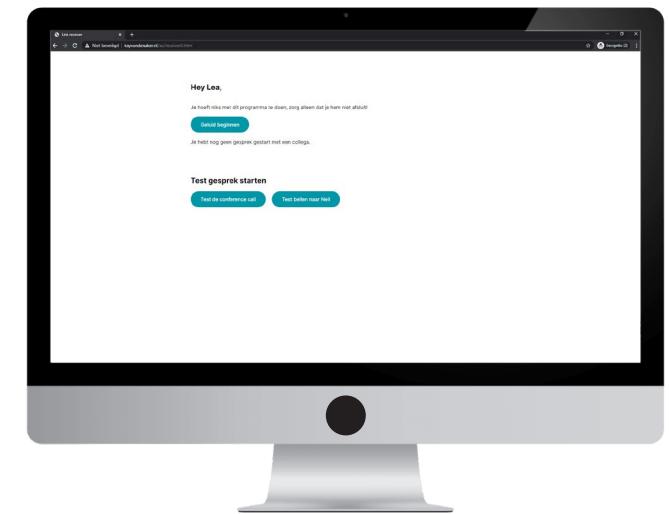
Start screen

The start screen of the application prompts whether this is the users mobile or desktop device.



Identification

The user is then asked to identify himself



Idling state

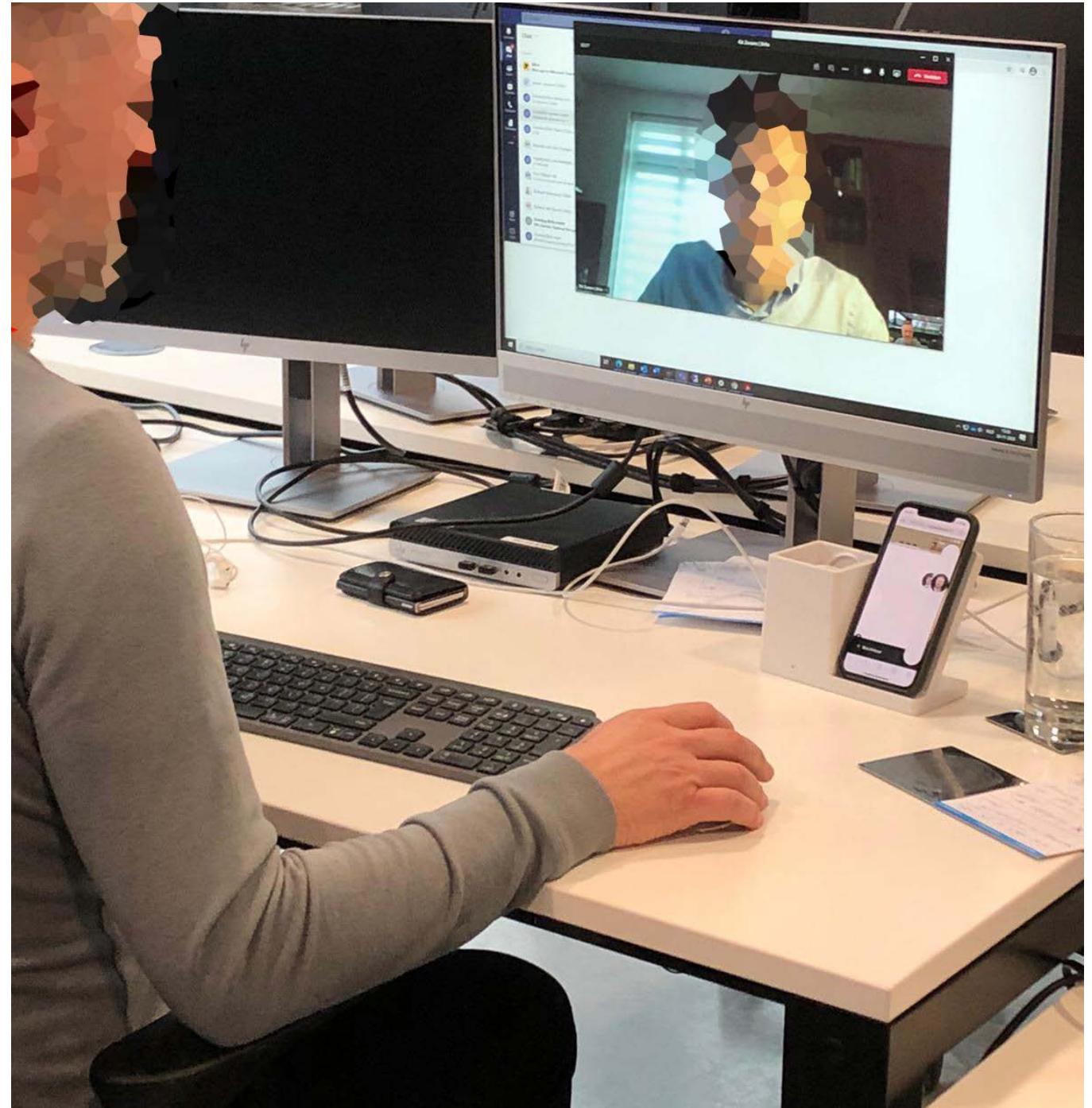
The user doesn't have to do anything with the desktop application, just let it run in the background, play sounds and open Microsoft Teams. Buttons were added to guide the user in setting everything up and making sure everything works; they can test if the sound works, test if they can join the conference call and test if they can initiate a video call.

Insights user test 2

Me and the office workers had an evaluation after them using the system for a full workday. They were enthusiastic about the concept and saw a huge increase in informal social interaction, they used the system especially during their breaks and when they were in need for a brainstorming partner. They mentioned that finding someone to discuss something work or non work related was much easier and they didn't feel like they were disturbing the colleague when they initiated a call.

They found the analogue openness of the slider to be a bit vague, especially with 6 people, it was sometimes quite hard to position yourself due to the lack of reference points in the interface. We discussed how they normally indicate their openness and they explained that this is usually done by positioning themselves in different areas of the office, for example they sat in the conference room if they wanted to do focused work or in the canteen if they wanted to chat. Together, we came up with the implementation of more reference points in the digital office using zones to place yourself in.

Most people liked the ambient office noises but one person was really annoyed by it and couldn't focus well, therefore he changed his availability to Busy. This was an inspiration to have customizable base sounds, if for example a user likes the sound of nature, this could be the base sound, the coffee grounding and chatter would then be on top of the nature sounds.



Deliver / Final Prototype

Graphical user interface

The different zones suggested by the office workers were implemented in the final prototype. The circular folding interface was most promising as this gave the user the possibility to scroll through different zones which fold open, show more information and provide the functionality to call someone in the same zone on a relatively small screen (Fig. 24). This is based on the Mode-relevant action-possibilities explained by Frens which states; "Mode-relevant action-possibilities are action-possibilities that are only offered when they are relevant for the mode-of-use" [5] (Frens, 2006, p. 87).

The user can make calls by going to the same angle as the coworker and press the dial or join a conference call by going into the lounge or meeting room. The zones have graphics and a background color that represents its intention, for example the yellow zone represents a creative space with some brainstorming equipment in the illustration. This zone would present the user with a calm and coffee shop-like soundscape with people chatting in the back, it is a place where people come to have creative sessions or ask questions for example. Each zone has its own vibe and intention to identify with.

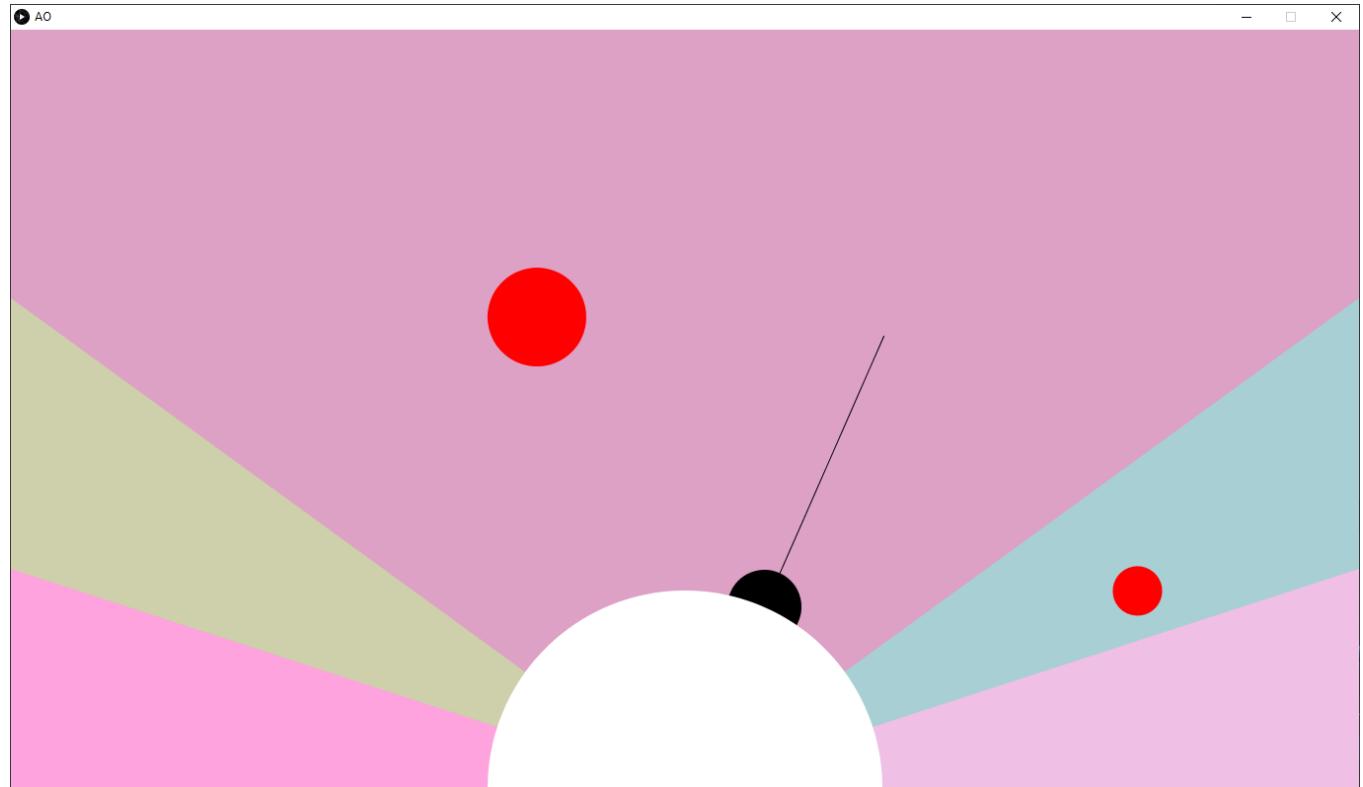
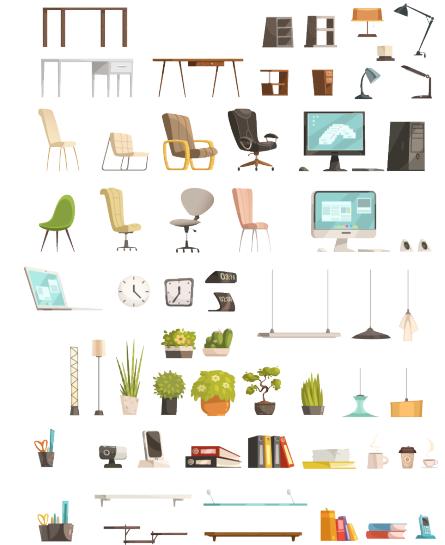
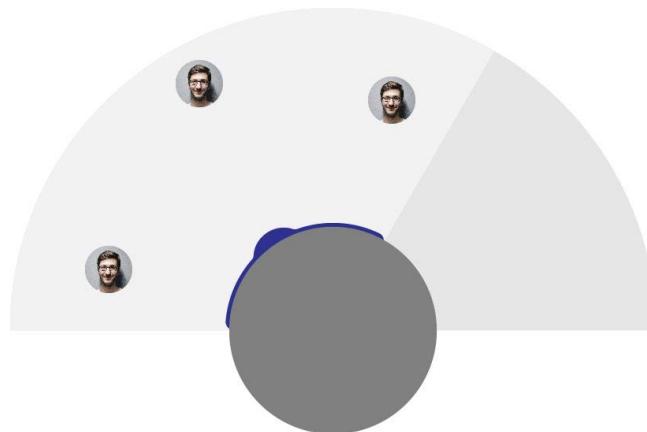
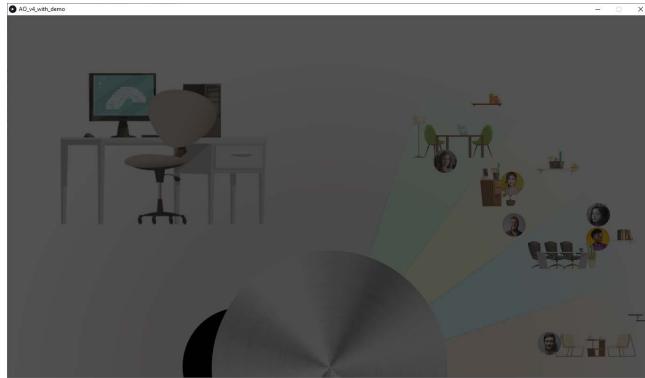


Figure 24 | Processing screenshot



Profile pictures [17], Furniture graphics [14]



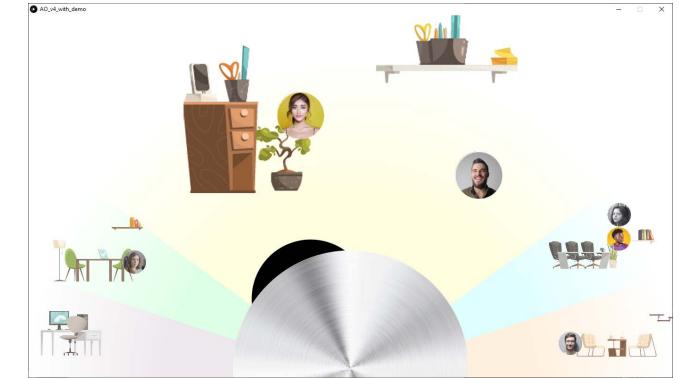
Initial state

The dial is all the way to the left, the user is not in the digital office and the ambient sounds are off. The coworkers can still be seen.



Joining the office

The user rotates the dial and the digital cursor rotates with it into the zone with the desk and a soft focused ambient sound plays. This zone shows to the coworkers that he is doing concentrated work and would not like to be disturbed.



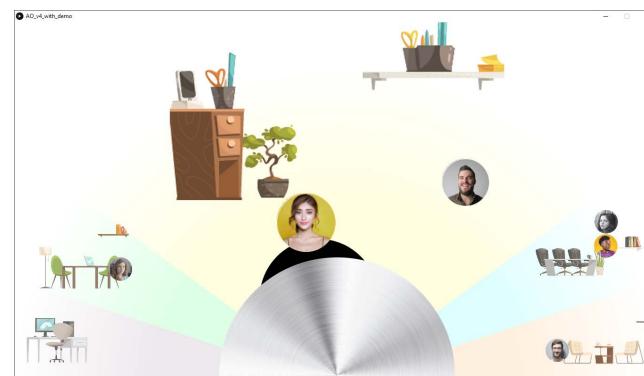
Switching zones

Scrolling to another zone changes the soundscape according to the zones intention and the coworkers present in it. The coworkers also see on their interface the movement of the user.



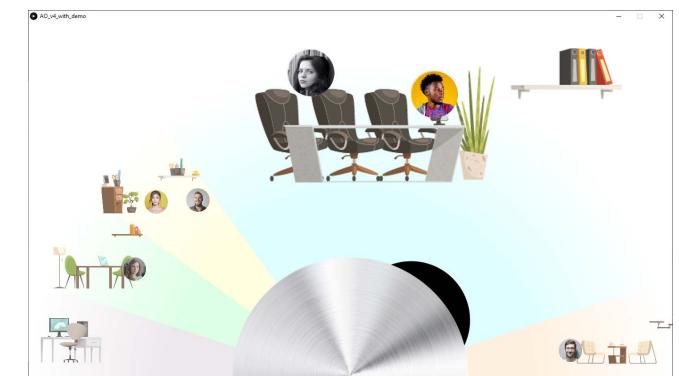
Selecting someone to call

If the user rotates the dial pointing towards a coworkers, their profile picture will grow in size.



Calling

By pressing the dial, a call is initiated and the profile picture of the coworker floats towards the dial.



Joining a conference call

If the user goes into the meeting room or the lounge, they are joining a conference call with everyone in that zone.

Electronics

A Raspberry Pi was chosen to run the final processing sketch of the interface, an Arduino Nano is connected which sends the value of the rotary encoder and the button over Serial. A small 10.1 inch LCD display received input through HDMI from the Raspberry Pi. Lastly, a stereo audio amplifier was added to play ambient sound through 3 Watt speakers on both sides of the device. An overview of the electronics was made using Fritzing (Fig. 25).

Enclosure

The next page shows the process of making the enclosure for the device.

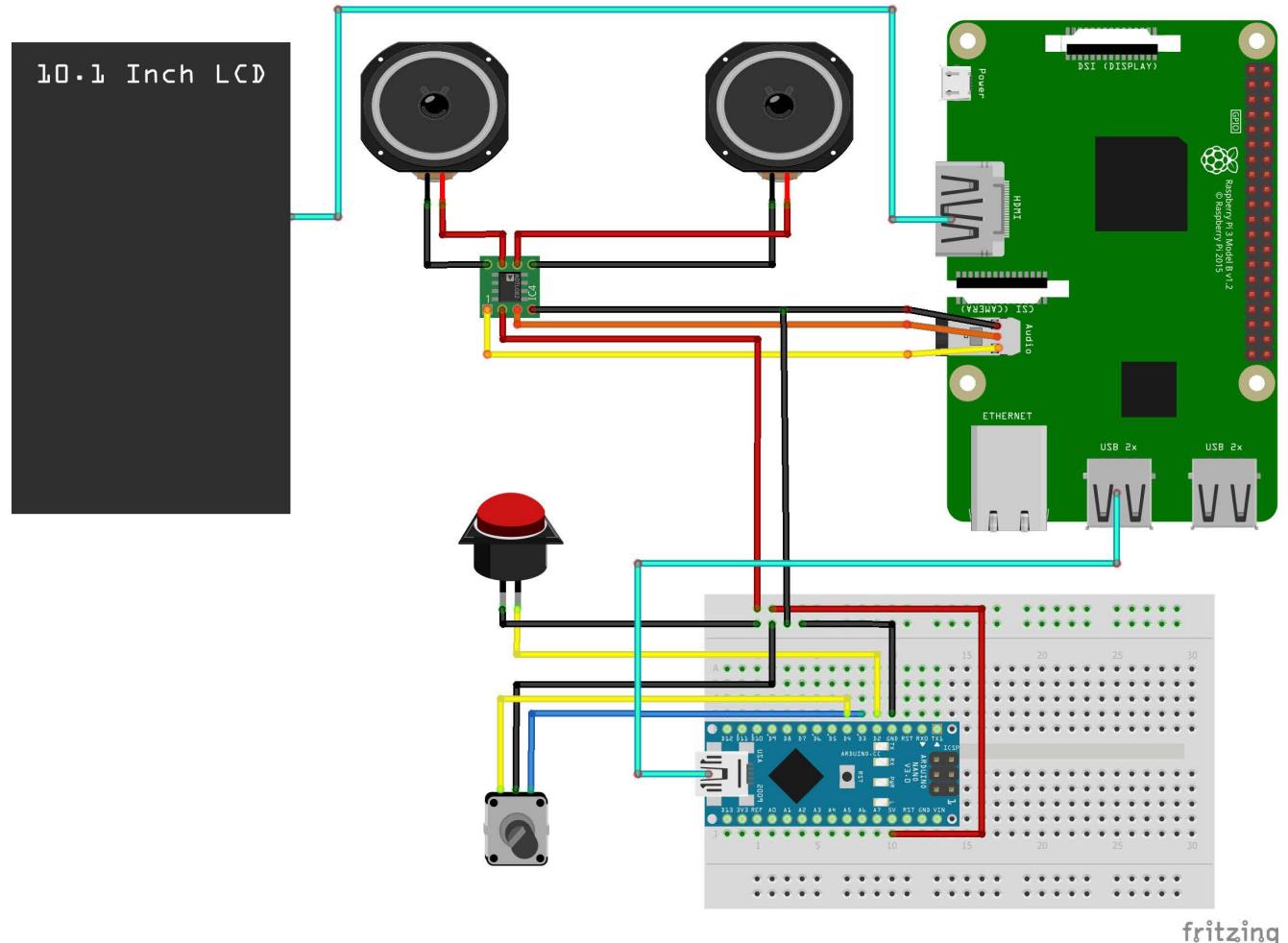
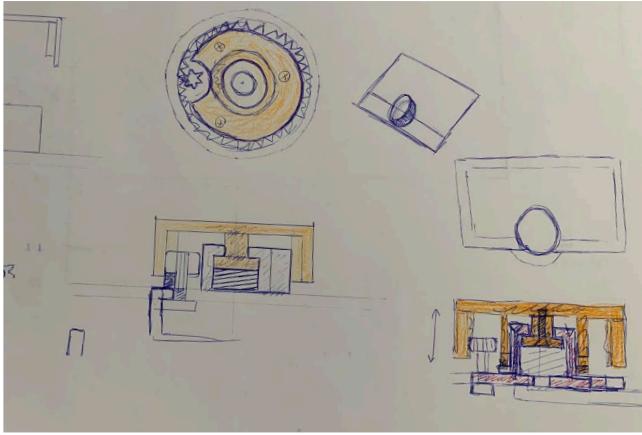


Figure 25 | Fritzing electronics overview



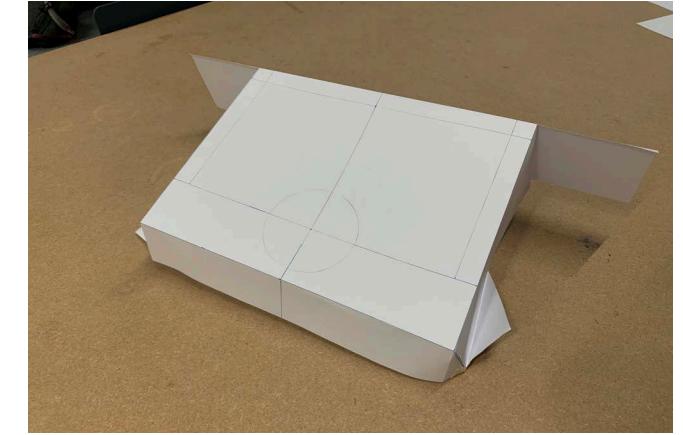
Dial mechanism

The dial should be floating over the screen which meant that the center of the dial would be inside the bezel of the screen. I designed a gear mechanism to create this effect.



Dimensions

The size of the gear mechanism and the display was analyzed to get an understanding of the total dimensions of the enclosure.



Paper mockup

A paper mockup was made to explore the shape, dimensions and especially the viewing angle of the screen.



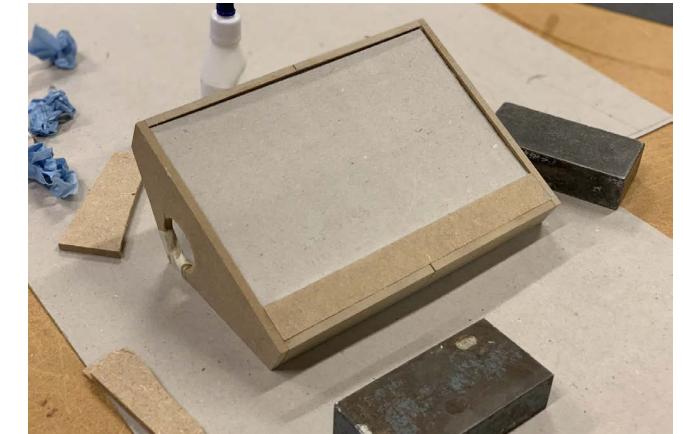
MDF mockup

MDF was used to make a more sturdy low-fi prototype of the enclosure shape. It was used to test fit the electronics and get insights in where to mount them.



Digital render

A render was made with the final dimensions to easily explore materials for the sides, front panel and dial. Fabric felt suitable in the home office as it gives a cozy yet clean and professional look.

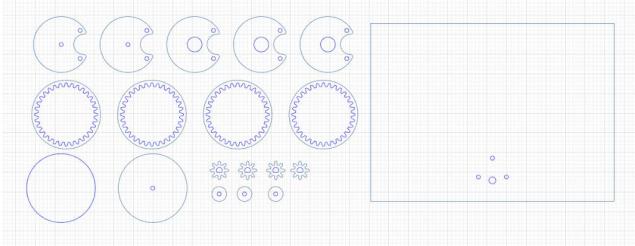
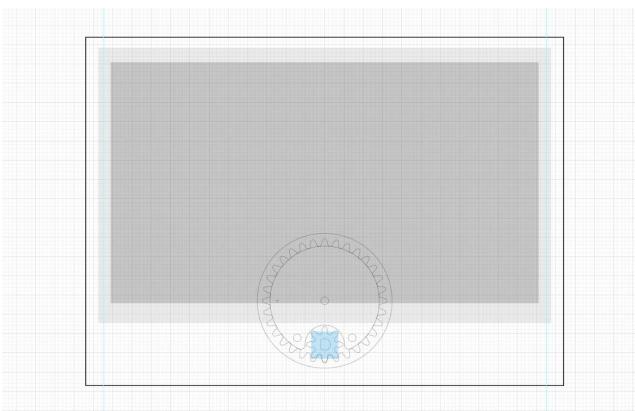


Final enclosure

The final enclosure was made using MDF as it is cheap, easily machinable and will not be visible because the fabric that will be stretched over it. The holes in the sides are for the speakers which will sit hidden behind the fabric.

Front panel

A laser cut was made of the front panel and the gear mechanism. The rotary encoder gives a nice click when rotating the dial, not only does the gear allow for the rotary encoder to be off centre, it also increases its precision from snapping to every 16 degrees to snapping every 4 degrees. This allowed a more accurate control in the digital interface.



Aluminium dial

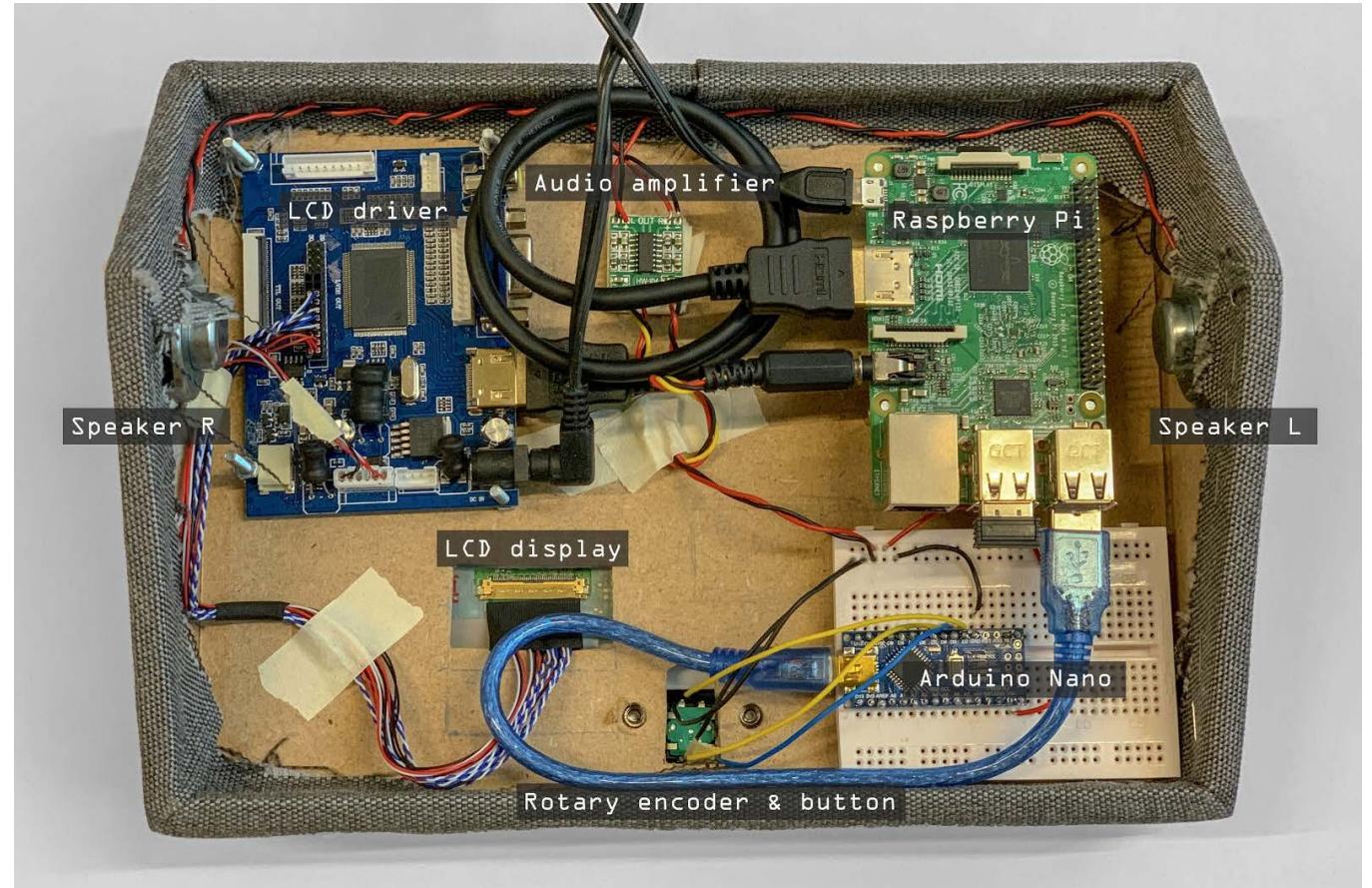
Besides adding fabric to the sides, a dial was lathe turned to hide the mechanism and give a polished look. A spacer ring was added to guide the dial in moving up and down.



Assembly and final evaluation

Lastly, the electronics, the front panel and the dial were mounted in the enclosure. The final demonstrator has now been finished. It was used to communicate the concept through a demo video which can be found in the Appendix.

The prototype was used and evaluated upon together with my housemates. The interactions with the graphical user interface through the dial were found to be intuitive and pleasant, the scrolling gives clear feedback on the screen as well through the haptics of the rotary encoder. The pushing of the dial to call someone needed to be explained as the pushing mechanism was not always working perfectly.



Final Design

In this chapter, the exact functionalities and behaviour of the Ambient Office will be elaborated in more detail.

The initial state is off, the cursor on the interface is all the way to the left, the sound is off and the screen is dimmed. When the user starts his workday, he uses the dial to scroll through the office to go to the zone he prefers to work in or join a conference call in the lounge or meeting room. This scrolling through the office mimics the behaviour of physically walking through the office and walking past coworkers. The overview of the different zones shows the user at a glance who is doing what and inherently who is open for formal or informal chatter. The user can walk past his colleagues and easily start conversations, the profile picture of the colleague will grow when the users' cursor is pointing towards them. The user can initiate a call by simply pressing the dial when the colleague is selected, the colleague will then float towards the user and a call is started on the desktop of the user. Other coworkers will see on their Ambient Office that people are moving around or having a conversation.

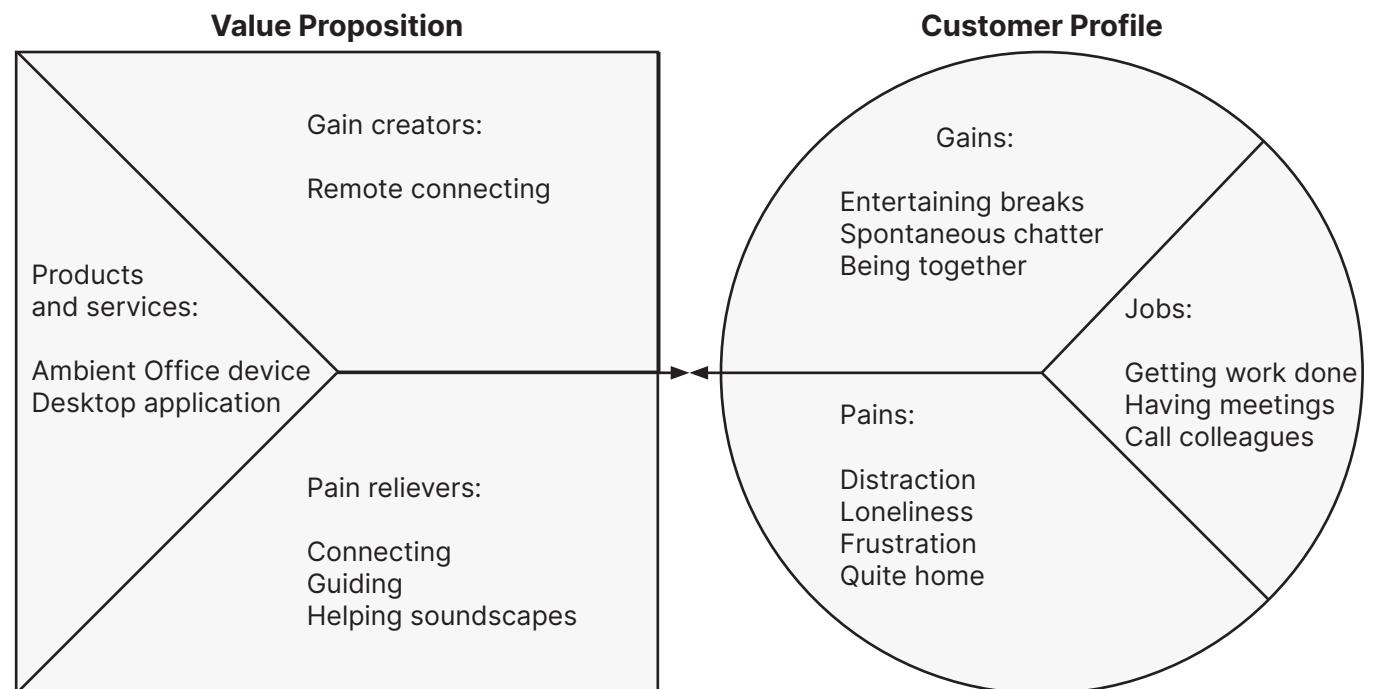
When the user is in a zone, it is folded open and the colleagues in that zone grow and spread out, this allows the user to select a coworker and start a call.

While scrolling through the various zones, the sound adapts accordingly. Meaning, if the user is at his desk, the most left purple area, a soft subtle focussed sound is playing, the user is getting work done so will not be distracted by office sounds. He can still look at the display at any moment and see what his colleagues are doing if he feels like a break or chat for example. All the zones have their own purpose with accompanying furniture and soundscape.

Business proposal

Ambient Office is a solution for remote working and is now more essential than ever. Working remotely will become more and more normal as we transition into the digital age, hybrid settings will become the norm and systems to help remove the barriers of digital collaboration are becoming essential.

I envision Ambient Office to be part of an office ecosystem such as Microsoft Office. It can seamlessly be integrated into the workflow of millions of office workers and help them stay connected with their colleagues. A full integration with Microsoft Teams and Outlook Calendar can automate big parts of the remote workers workflow and help them with connecting with their colleagues so loneliness among remote workers is a thing of the past!



Discussion

COVID-19

The virus was rushing over the world as I started my final bachelor project. This had some influences on my process which will be elaborated here. First of all, as explained in the prologue, I design and explore by prototyping a lot. Not being able to use all the facilities on the campus and being together with fellow students had a big impact on me. Not being surrounded by other proactive and creative students was hard and much more energy was asked to go through a creative process and especially a thesis project where you work alone.

Final concept testing

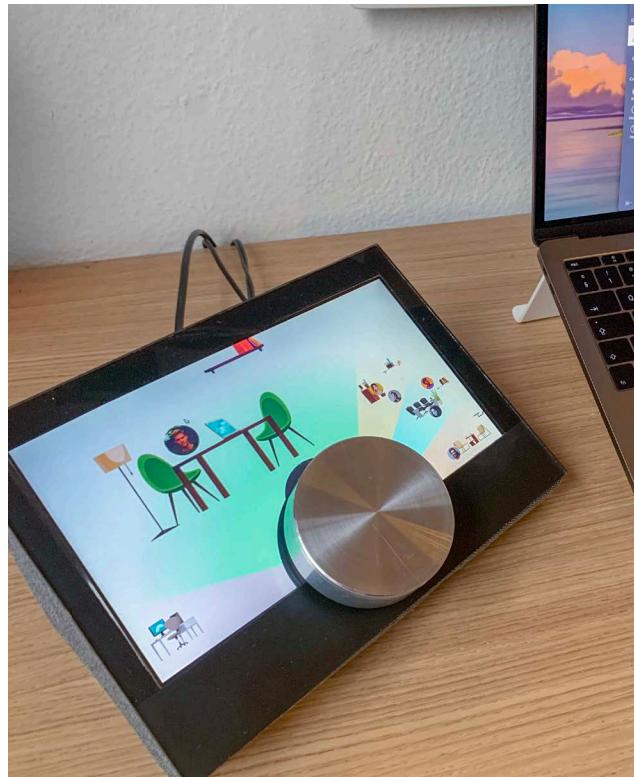
Due to the lockdown, I was not able to test the physical prototype with office workers but only with housemates. This is something that should be done in the future to validate the updated visual overview and the interactions with the dial.

Desktop application

The desktop application was only touched upon very briefly in the second user test but should be looked at more if the concept is going to be translated into a complete service. The desktop application needs to run on the computer to open video call and play ambient sound but has the potential to be a platform where the user can customize their digital office space; the layout of the zones and the graphics in them as well as the sounds. As briefly mentioned in the insights from the second user test, different base sounds should be explored to create a suitable soundscape for everyone to work in.

Final prototype

As the demo day of the university was online, my focus was on creating a convincing video and accompanying pictures and graphics. For this reason, I did not fully work out the software on the Raspberry Pi and instead attached the screen, speakers and Arduino to my laptop and run the software from there. Processing for Pi is a big community with custom disk images to run on the Raspberry Pi to run Processing on it so I am confident that this would be no problem to set up.



Conclusion

This report has elaborated my design process during my Final Bachelor Project within the squad Designing for Growing Systems in the Home. Now I look back at my prologue and introduction and evaluate the outcome.

To start, let's take a look at the research question: "How can design and technology play a role in enriching the home working experience?"

The power of technology to connect us in combination with rich intuitive design has proven it can be part of our workflows and make working at home more pleasant and enjoyable.

Looking back at the problem statement: "Enhance (informal) social interaction between remote workers to increase inclusiveness and productivity at home".

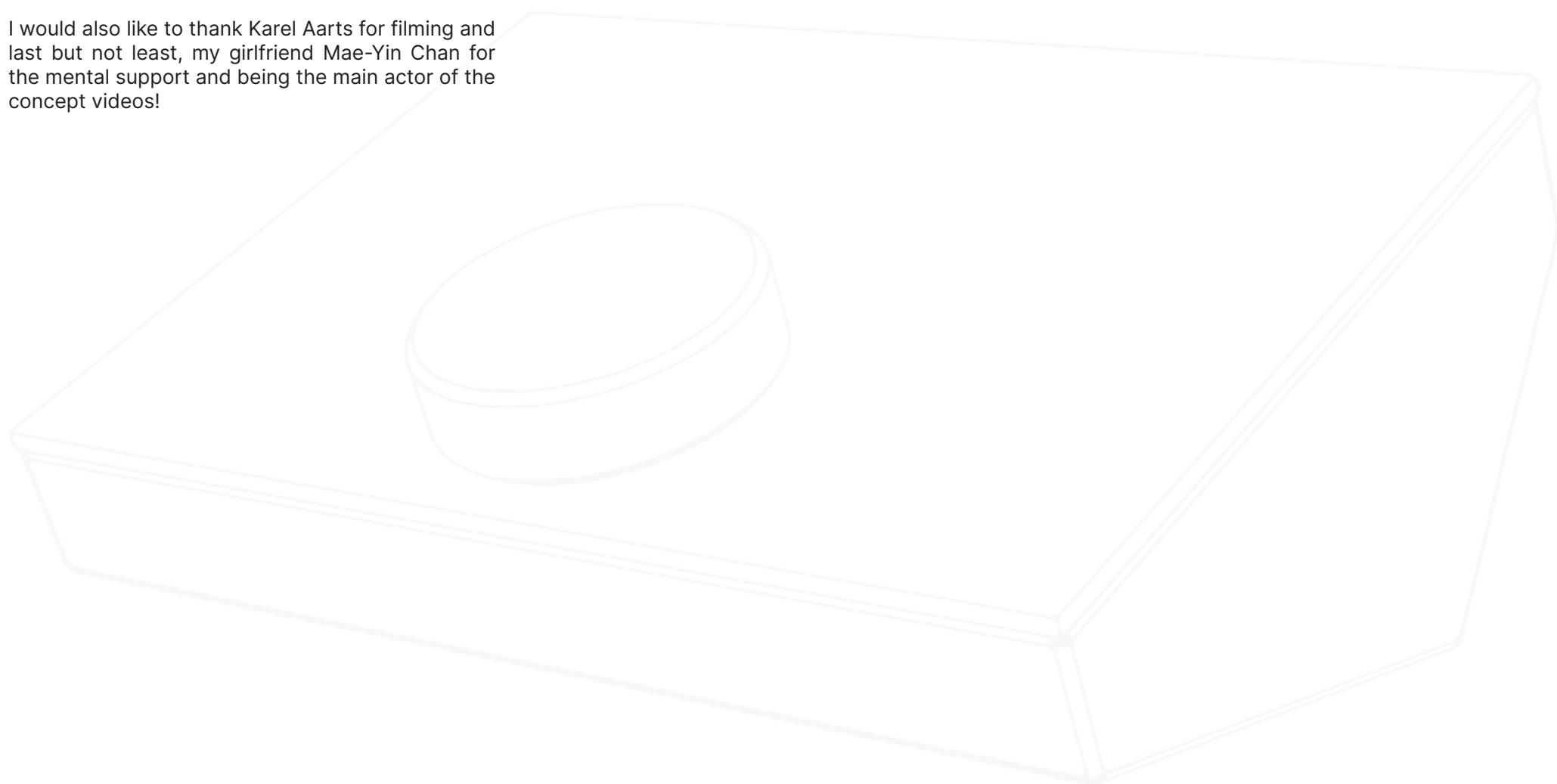
The user tests have shown that an increase in social interaction was achieved by the use of the devices by home workers. A visual overview of the office and its coworkers in combination with adapting soundscapes and an intuitive physical interface gives the user the feeling of being among coworkers and lowers the threshold to start conversation or join conference calls.

Although user testing with physical prototypes was difficult due to the pandemic, I am confident to say that I am steps closer to my goal of connecting people through my designs. My focus and interest in interaction design and experience prototyping have flourished the past few months during the creation of everything from the first mockups to soldering the final electronics and programming the interface. My prototype shows a polished concept which I am proud to put on my portfolio, I hope you enjoyed reading!

Acknowledgements

First of all, I would like to thank my coaches Bart Hengeveld, Holly Robbins and Renee Noortman for their support and inspiration during the past semester and for keeping me sharp and on track throughout my process.

I would also like to thank Karel Aarts for filming and last but not least, my girlfriend Mae-Yin Chan for the mental support and being the main actor of the concept videos!



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Appendix

I decided to not put in the codes of the prototypes as that would be tons of pages but these can be viewed upon request.

Link to sounds <https://drive.google.com/drive/folders/1rwVu0BiYgvH1e4CN-moDJ909oiw1LhWg?usp=sharing>



Link to midterm video: <https://youtu.be/7XITkTCeO3k>



Link to final video: <https://youtu.be/nwUdHMbM90k>

Sound survey responses

By checking this box you agree to participate in a creative session and share your insights about various sound samples	How many colleagues are present	Describe what the colleagues are doing. Multiple activities can happen!	Describe the atmosphere in the office and how you feel about it	How many colleagues are present	Describe what the colleagues are doing. Multiple activities can happen!	Describe the atmosphere in the office and how you feel about it	How many colleagues are present	Describe what the colleagues are doing. Multiple activities can happen!	Describe the atmosphere in the office and how you feel about it
I give my consent	8+	Multiple discussions between people, walking around, someone very enthusiastically writing with a marker, someone eating	Social, open, motivating, I like it for low-focus work (e.g., emails) but not for deep work.		Two colleagues working on computers, one 3 intermittently writing.	"Standard office work vibes" -- everyone just working in silence. Feels corporate/limited in creativity and openness.		One colleague who's printing out a document and rolls his chair to retrieve it. Intermittent writing.	Same as previous.
I give my consent		Someone is writing/sketching. Maybe he/she is doing a brainwriting session or something similar to that because of the metronome sound. Sounds like people a bit further away are having a break (or at least non-professionally chatting). People are moving around in their chair. Maybe people walk into a meeting, or walk out of a meeting room while chatting. Stacks of paper are slapped on the table (hoe noem je dat als je een aantal vellen bij elkaar pakt en op de tafel "staat" zodat het stapeltje mooi alignied is?).	I like the background sounds, its quite cozy and chill. It doesn't feel very professional or serious, but that's exactly what I like. I don't know what the ticking/metronome sounds is but I dont like it very much.		at least two colleagues are typing on their computer. It also sounds like a person is drawing or sketching and flipping pages. It also sounds like someone is touching a glass 3 or cup, maybe far away in the background.	Its' a bit more serious because no one is talking. The rain or wind (not sure what it is, maybe an airco) makes it sound a bit cooler/less cozy than the previous sound sample		One colleague is printing something, or at least working with the printer. You can also hear a pen clicking and someone writing, so the other 2 colleague is writing something down, printing, writing, walking away (pushing off their desk on the rolling chair)	the printer is very present which could be annoying, but somehow it also gives me the feeling the atmosphere is a bit more loose, like you're allowed to make noise. I kinda like it I guess, although if people are printer all day long right next to me, I would get kind of crazy.
I give my consent	10	writing, meeting, discussion	open office, laid back character, can be distracting		2 typing	lonely, isolated, next to an big window		3 chair)	small, cramped, but tight knit office
I give my consent		Some are chatting or having a meeting. I feel like there's one person moving around paperwork, maybe next to the printer or copier, some colleagues are moving around	A little noisy, it would be difficult for me to focus, it does sound like a friendly working environment which is definitely a good thing for me!		2 Vigorously typing on their computers	A bit boring but very focussed		Copying or printing, and walking around with some sort of cart	Also a bit boring but focussed
I give my consent	A lot, group work or lots of communication seems to happen and writing/drawing at the same time.	Writing, Drawing, Meeting, Discussing, Imitating a clock,	Rowdy. At the moment I'm rather stressed out and I'd feel more comfortable with a timid and silent environment. But I can also appreciate liveliness around me when I am doing creative work.		Typing very loudly, drawing, 3 Typing very nearby...	Focussed, I like to know that others are putting in the work, good kind of peer pressure.		Printing, 2 Drawing,	Sounds small and cosy because of the 'nearby-ness' of the printer.
I give my consent		A clock is ticking, rearranging papers/desk, discussing 5 topics, catch up	The atmosphere is quite relaxed, nobody is really working focussed but still doing work-related things. It makes me want to join the conversation and maybe rearrange my desk.		4 Typing, sketching and writing (with a marker).	It is a rainy day outside and you are all working hard in the office, it is a productive day. I really like this sound, makes me want to start working hard. And the rainy sound and typing sound are satisfying.		Printing, clicking with a pen, moving 1 chair.	Someone is printing. It feels like im in a quiet office where someone needs to do something, feels more distracting.
I give my consent		3 someone is writing with a pencil others are re talking	kind of stressful		2 typing on a keyboard	not much communication, everyone is busy with their		1 printing and scanning, maybe someone it feels like a printer room, you prin	
I give my consent		5 Discussing something, talking, writing/scribbling, doing paper	Crowdy, chaotic. Doesn't seem like a nice atmos		2 Scribbling/writing, typing, boiling water?	More quiet, seems like a nice atmosphere to do some		0 Scanning/copying/printing, grabbing stu	Little bit noisy, administrative envin

L	M	N	O	P	Q	R	S
How many colleagues are present	Describe what the colleagues are doing. Multiple activities can happen!	Describe the atmosphere in the office and how you feel about it	What sounds did you find most pleasant, annoying or significant? Or do you have any other thoughts about the ambient office?				
8+	Multiple discussions in the background, someone printing, walking around, someone printing and someone writing. There is someone writing/typing, someone is typing behind its computer, someone is printing something, I am also pretty sure someone is paging through a book or magazine. A bit further away people are talking or discussing things.	Active and noisy, but open. Similar to sample #1 but more distracting. It sounds like a busy office where a lot is going on. It's quite cozy/you're allowed to make noise. The first time I listened to it, I found the typing and drawing a bit annoying because it is so hasty, as if the colleagues are very short on time, but the second and third time listening were less annoying, you kind of get used to it I guess.	Handwriting and background conversations are pleasant. Keyboard sounds are distracting but tolerable if they're not too loud. Machine sounds (such as the printer/scanner) are quite distracting. The sound of walking/rolling makes the office sound active in a more pleasant way than keyboards and machines, but is distracting.				
10+	writing, printing, having lunch, typing	open office, smaller team than the first one.	The overall background noise of people was really disturbing, i didn't mind people typing and printing and rolling in their chairs, but when there were more than 4 people it made me very agitated and unable to focus				
Horrible	Meeting, Chatting, Typing too loud, Writing, Drawing, Talking to themselves.	Too busy. Sounds like all the assumptions I have against corporate offices, especially that people just pretend to be working very hard.	The nearby typing was most annoying with printer coming in as close second. Could the typing go more to the background? Too ASMR in general for me! Everything!				
or more	Typing, printing, writing/sketching (with marker), talking (catching up)	A busy day at the office, maybe some people are in a meeting, other people are working individual. A bit too much going on for me, feels distracting.	Sample 2 was by far the most pleasant to work. I would go for one type of atmosphere for a sound, fitting by the task you need to do.				
	typing, chatting, writing by hand, 5 Chatting, copying/printing, typing	Noisy, loud, crowded. Not pleasant.	Noisy, loud, crowded. Not pleasant. Calm, soft typing was pleasant. Soft rhythmic sounds are nice because you don't have to focus on them. They are predictable and thus are nicer for background sounds.				

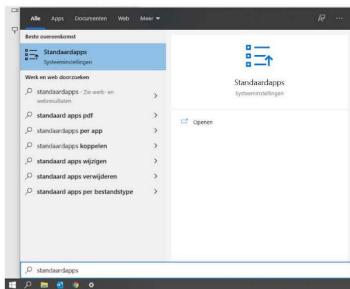
Manual office workers

This is the manual sent in advance to the office workers

Ambient Office uitleg

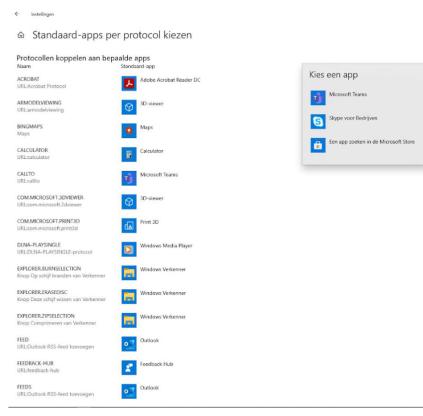
1. Windows instellen

- Zoek op je computer: standaardapps



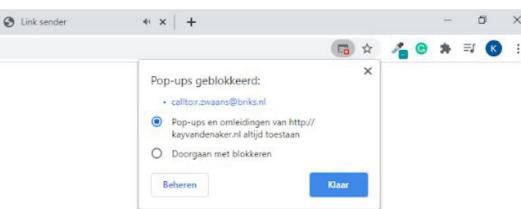
- Kies onderaan: standaard-apps per protocol kiezen

- Zoek **CALLTO** en selecteer Microsoft Teams.

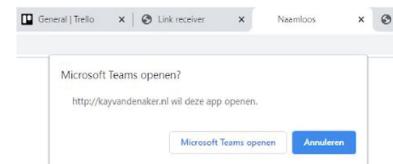


- Open <http://www.kayvandenaker.nl/ao/> op je telefoon en computer en volg de stappen.

- De eerste keer dat je een gesprek start moet je pop-ups altijd toestaan van de site.



- En als laatste Microsoft Teams openen. Dit kun je testen met een gesprek naar Hans, je belt dan niet direct maar checkt alleen of Teams goed is ingesteld.



- Als het goed is ben je nu klaar, klik op geluid beginnen om te starten, veel plezier!

Zet je telefoon met de website open naast je werkplek zodat je het goed kunt zien tijdens het werken. De geluiden komen vanuit de computer. (je kunt instellen dat je telefoon niet uitgaat als je er niet aan zit)

iPhone: Instellingen > Beeldscherm en helderheid > Automatisch slot > Nooit
Android: Instellingen > Display > Time-out scherm > 10 minuten

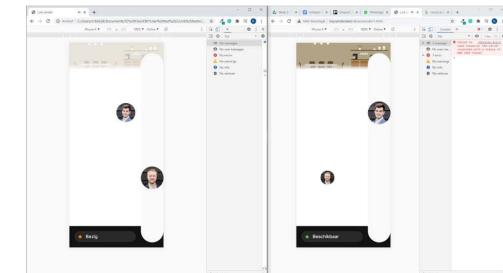
Als je je telefoon of computer uitzet of gaat, dan kan het gebeuren dat hij niet goed opnieuw verbinding maakt dus het beste is om dan de pagina te herladen.

Je kunt in de app later zien hoe open je staat voor een babbel door de schuif rechts te gebruiken. Hoe hoger hoe meer open, en helemaal boven ga je in de groeps vergadering waar je kunt praten tijdens de lunch bijvoorbeeld.

Als je schuif op dezelfde hoogte als iemand anders zet wordt die aangetrokken en start je een gesprek op je computer in Teams.

Als je weg gaat kun je je schuif helemaal naar beneden doen, dan zien andere dat je niet meer aan het werk bent.

Je kunt je beschikbaarheid aanpassen met de knop links onder, dit verandert het volume van de omgevingsgeluiden en laat aan andere zien of je bijvoorbeeld in een vergadering zit.



Kay van den Aker
Eindhoven University of Technology
k.v.d.aker@student.tue.nl
0633010771

User test 1 consent form

This is the consent form for user test 1



Information form for participants

This document gives you information about the study "Ambient Office". Before the study begins, it is important that you learn about the procedure followed in this study and that you give your informed consent for voluntary participation. Please read this document carefully.

Aim and benefit of the study

The aim of this study is to measure how home workers respond to ambient sounds, an overview of their coworkers and easy access to video calls. This information is used to create a more tailored design for home workers to enhance their inclusiveness in the digital office.

This study is performed by Kay van den Aker, a student under the supervision of Bart Hengeveld of the Eindhoven University of Technology (TU/e).

Procedure

You will be given a device to put where you work at home where you input your current availability for informal social interaction. It will be connected to your PC and will use your email address to start video calls with the researcher as well as fellow participants. This data will not be stored. Your behavior with the artifact and social interaction with others will be observed throughout the day as you use the product to start calls, change your availability and listen to the ambient sounds.

Risks

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

Duration

The instructions and measurements will span approximately one work day, the prototype will be delivered (clean) the day before the test and the participant can start using it when they would normally start their work from home until they are done working for the day.

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 up to 24 hours after they were recorded. 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 and 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 (such as unidentifiable pictures) and experimental data (for example your behavior with the product) will be anonymized, recorded, analyzed, and stored. The goal of collecting, analyzing, and storing this data is to answer the research question and publish the results in the scientific literature. To protect your privacy, all data that can be used to personally identify you will be stored on a local computer for one week after the test and after that at least 10 years on the university server which is only accessible by the researcher. No information that can be used to personally identify you will be shared with others.



No video or audio recordings are made that could identify you. The voice/video calls made throughout the day will not be saved or distributed. It will only be used to observe the behavior with the product.

Further information

If you want more information about this study, the study design, or the results, you can contact Kay van den Aker (contact email: k.v.d.aker@student.tue.nl)

If you have any complaints about this study, please contact the supervisor, Bart Hengeveld (b.j.hengeveld@tue.nl). You can report irregularities related to scientific integrity to confidential advisors of the TU/e.



Informed consent form

Ambient Office

- 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. 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 permission to use my data up to 24 hours after the data have been recorded.
- 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

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

Participant's Signature

Date

User test 1 ERB

This is the ethical review form for user test 1

Ethical Review Form (Version 27.06.2019)	
<p>This Ethical Review Form should be completed for every research study that involves human participants or personally identifiable data and should be submitted before potential participants are approached to take part in the research study.</p>	
Part 1: General Study Information	
1 Project title	Designing for Growing Systems in the Home
2 Researchers	Kay van den Akker
3 Email researcher	K.V.D.A@rikstudent.tue.nl ; B.J.Hengeveld@tue.nl;
4 Supervisor(s)	Project coach: B.J.Hengeveld
5 Faculty/department	Industrial Design
6 Research location	The Netherlands
7 Research period (start/end)	February 2020 - July 2021
8 Funding agency	-
9 If (Applicable) Study is put at an educational course with code:	DIP900 Designing for Growing Systems in the Home
10 If (Applicable) Study has already received approval from the Review Board, add name, date of approval, and contact details of the IRB	The Designing for Growing Systems in the Home (DIP900) study has been reviewed by a panel that aims to explore the next frontier of design: systems design. It aims to familiarize students with a new methodology for design that is based on design as a discipline that actively tries to explore new possibilities in designs in terms of solutions and approaches.
11 Brief description of the research question	The semester long projects are characterized either as "design" projects or "design research" projects. Both of these types of projects involve "research by involvement" and this Ethical Review Form offers two opportunities throughout.
DASIN Design Projects (B2-P2, BFB, M1-Design)	

design proposal as well as to surface (potential) issues of the design and to identify the qualities that are important to be done through (communications etc.):

- audio recording
- (semi-)structured data logging (proto-type or prototype)
- video recording
- diary studies
- (semi-structured) interviews
- (online) surveys
- home observation
- images

Additional: alternative user involvement: Potentially students can be asked to let students occasionally deviate from the planned course of in-home deployments. These deviations follow the following steps:

- weekly studies with fellow students
- Alternative users falling adhesion to implement their own deployment (e.g., audio recording, expert panel (internal or external experts))*

(3) **Consolidation:** the data from the deployment and the analysis of the deployment and the proposal is created based on the insights from the analysis.

User involvement: Occasionally students opt for additional user involvement in the consolidation phase. This can be done by involving the original final iteration of the design proposal. This is done through the following steps:

- usability studies with fellow students
- usability studies with the original families of
- in-home deployment
- expert panel (internal or external experts)

It is NEVER allowed to make new audio, stills or video recordings during the consolidation phase as this would be considered as a new context for design (e.g., through a deployed prototype). Audio, stills and video recordings is only allowed if there is only a slight deviation from the present and operating the recording equipment. Should this be the case, it is required to submit a proposal to this (and a new submission to the EIRB to be considered).

BIGDATA Design Research Project (B2-P3, FBP, MI-Research)

- Children under the age of 6-years-old
- Informed consent will be sought from all participants. Without explicit signed informed consent, no data collection can take place.

DIGIM Design Research Project (B2-P, FBP, MI-Research)
Healthy adult participant

Depending on specific research questions, we might include healthy adults as research. They will however always be interviewed in the presence of a parent, after informed consent has been given.

Specific selection criteria are:

- People that represent the target-group that is relevant for the research question
- Fluency in English or English language

Exclusion criteria are:

- Physical or mental impairments limiting participation in the studies, or their understanding of the consent form and procedures.
- Children under the age of 6 years-old

Informed consent will be sought from all participants. Without explicit signed informed consent in place, no data collection can take place.

DIGIM Design Project (B2-P, FBP, MI-Design)
DIGIM Design Research Projects (B2-P, FBP, MI-Research)

Self-reported data

- Documentation of daily experiences with or without deployed prototypes
- Use experience questionnaires
- Use questionnaires

Researcher collected data*

- Video or audio recordings of interviews
- Transcripts of interviews
- Photos of context (no recognizable people)

General generated data

17 Provide a brief statement of the risks you expect for the participants or others involved in the proposed educational activities or research. Take into account any personal data you may gather and privacy issues.

The benefits are clear – we learn about new ‘materials’ for design and how to use them in system design challenges. We get handles on ‘behaviour change’ and how to support it. Additionally, we also learn about design methods and processes that encourage innovation in engaging these new designity challenges.

We see possible harm in the use of effort, but at the same time the benefits of knowing where not to look for answers.

18 Provide a brief statement of the risks you expect for participants and the researchers involved in the proposed educational activities or research. Take into account any personal data you may gather and privacy issues.

Participants will not be exposed to risks associated with the intervention as they will only start at the end of the study. The researchers will have access to this data only with prior consent from the participant and will not be exposed to risks associated with any moment.

Children themselves will always be interviewed in the presence of a parent, after consent has been obtained.

Questionnaire data include only low risk information with results being only presented in aggregate. Hence, we expect no risks from the questionnaire for our participants.

Interviews and observations conducted within our research will be limited to the extent that they are exclusively on the usage and experience of using the prototype. Participants will be asked to provide feedback on the prototype and its usage. In addition, an amendment to this proposal and a new submission to the EIRB will be needed.

Additionally, the risks that will be added to participants are those associated with questionnaires and observations. These risks will be such that they do not deviate from regular activities. The risks associated with the design process can form an exception here because they can be important to prevent disrupt. For these cases (i.e., when design process is disrupted), an amendment to this proposal and a new submission to the EIRB will be needed.

Self-reported (collected via user research methods). Researcher collected or sensor data will be coded and indicated in numbered manner. The coded data will be kept in a separate document.

8	Will participants be asked to discuss or report sexual experiences, religion, alcohol or drug use, or suicidal thoughts, or other topics that can be sensitive or intimate?	X	
9	Will a convenience sampling strategy be used? (e.g., requiring participants to wear a device* 24/7 for several weeks, to fill in questionnaires for hours, to travel long distances to a research location, to be interviewed multiple times)?	X	
10	May the researcher procedure cause discomfort or distress to the participant in any way? (e.g., asking participants to recall painful past events more than mild discomfort, stress, anxiety or by administering drinks, foods, drugs)	X	
11	Will blood or urine (biomarkers) be obtained from participants (e.g. also external imaging of the body)?	X	
12	Will financial inducement (other than reasonable expenses and compensation for time) be offered to participants?	X	
13	Will the researcher require the use of physical devices that are not "CE" certified?	X	
Important: If you answered "no" questions with "yes", you can skip parts 8-14 and go directly to part 5. Check which documents you need to revise and continue with signature and submission.		Check	
If you answered one or more questions with "yes", please continue with parts 3 - 5.			
Part 3: Study Procedures and Sample Size Justification			
1	Elaborate on all boxes answered with "yes" in part 2. Please have the box highlighted any portion of text for the research participant.		
		With regards to part 1, question 1: Children of involved will always be interviewed in the presence of a legal representative (parent, guardian), after informed consent has been obtained. The researcher will keep a record of the date and time of the interview and the name of the child and the name of the legal representative. The researcher will keep a record of the date and time of the interview and the name of the child and the name of the legal representative. The researcher will keep a record of the date and time of the interview and the name of the child and the name of the legal representative.	
		With regards to part 2, question 5: All contact with the research subject will be conducted through the research data and participant information system. Research data is that necessary for the study and will never contain personally identifiable information. This data is stored on a secure server and is only accessible to the researcher. Participant details are that necessary to sense the study (contact details, address, telephone number). These details will be stored in a protected file and will be deleted after the study finalizes. Participants details will never be shared with third parties. The researcher will keep a record of the date and time of the interview and the name of the child and the name of the legal representative.	
		With prior and specific consent: research data can include pictures, video, audio recordings, and other personal data. This data will not be stored in a database and will be destroyed as soon as possible. If there are pictures that do not contain identifiable data (e.g., faces of	

<p>1 Explain whether your data are complete, accurate, or if they have been deleted (pseudonymized or anonymized) and explain how</p>	<p>The collected research data will not contain identifiable data as research data is explicitly separated from personal data. Personal data is defined as data that can be used to identify an individual, either directly or indirectly. This includes the name, address, telephone number and/or pseudonym only. In case of a follow up study these randomized numbers will be used to identify the participants. The pseudonym will be deleted after the participants have completed the study and deleted right after. If necessary, the participants are made aware of the fact that they are pseudonyms so that the participants themselves have key to their data.</p>
<p>The research data will be kept on a password protected academic server at the University of Twente. The data will be stored until the participants data collected during the study will be processed confidentially and deleted subsequently, and test subjects will not be able to access the data.</p>	
<p>2 Who will have access to the data?</p>	<p>Only the main analysts, squad coaches and trustees will have access to the data.</p> <p><input type="checkbox"/> No</p> <p><input checked="" type="checkbox"/> Yes, and I declare I will follow the general data protection regulation (GDPR).</p>
<p>The research data does not contain identifiable data and will be used for the following purposes: scientific publications and research purposes. For projects that lead to a publication, the research data is stored for five years after publication. The research data is stored for five years after publication.</p>	
<p>3 Will you store personal information that will allow identification of the participant from data? See GDPR article</p>	
<p>No</p>	
<p>I, and I declare I will follow the general data protection regulation (GDPR).</p>	
<p>The research data does not contain identifiable data and will be used for the following purposes: scientific publications and research purposes. For projects that lead to a publication, the research data is stored for five years after publication. The research data is stored for five years after publication.</p>	
<p>The research data will be stored by password and limited access will be given to the main analysts, squad coaches and trustees. Unauthorised processing or accidental loss of data.</p>	
<p>The research data will be stored for five years after publication. Researchers for an electronic copy of the data that he/she has provided or that have been measured directly at him/her. If they are dissatisfied with how data privacy is handled, they can submit a complaint to the Data Protection Officer of the University of Twente or the Data Protection Officer and the Data Protection Officer of the Endhoven University of Technology via privacy@ut.ac.nl or contact the Dutch Data Protection Authority.</p>	

12. Description of the research method	13. Description of the research method
<p>Ethical Review Form</p> <p>Design projects are set around mundane characters (familiar people living in a small model of a house (the <i>life Simulation</i>) and revolve around thematic challenges with an open framing (e.g., energy use, waste reduction, etc.). The good quality sleep strengthens with company clients (e.g., helping their stakeholders (e.g., United States of Nansen).</p> <p>DIGISM Design Research Projects (B2-P3, B2-P4, MI-Research)</p> <p>Design research projects are centered around research questions originating from the coaches of the DIGISM square. These questions are related to the following areas: (1) practice theory in the context of energy transition, (2) non-mechanistic approaches to energy transition, (3) design methods and supportive systems, (4) interaction styles for connecting people.</p> <p>DIGISM Design Projects (B2-P2, B2-P4, MI-Research)</p> <p><i>Design phase & user involvement:</i> The DIGISM design process knows three phases:</p> <ul style="list-style-type: none"> (1) Contextual inquiry: This phase is about the design challenge and design for the mundane characters in the <i>Life Simulation</i>. (2) Design development: This phase is informed by "user research". This phase ends with an experimental prototype of the design proposal. (3) User involvement: In the communication phase, stakeholders interact with the mundane characters, and through these, their design projects are developed. This phase is a systematic research method or combinations thereof. This is done through (combinations of): <ul style="list-style-type: none"> • (online) surveys • (semi-structured) interviews • diary studies • home observation <p>(2) Evaluation: Students evaluate their prototypes and aim to generate insights towards improving their design.</p> <p><i>User involvement:</i> The design proposal is deployed in the <i>Life Simulation</i> for up to a week. The aim for this deployment is to</p>	

Ethical Review Form	
	The REU/Design research projects follow affirmative design research approaches that employ qualitative and quantitative research methods or combinations thereof.
	Research through design approach: Design research projects are associated with: Typically, a small number (1-8) of prototypes is made to engage in a field or lab study with a group of participants. <ul style="list-style-type: none"> • in house deployed • (semi-)public (e.g., in prototype or remote) • diary studies • (semi-structured) interviews • (online) surveys • home observation • user testing
	ab 18, if not VNR, allowed to make remote studies, still with video recordings of participants or households or any contact for design (e.g., through a deployed prototype). This is only allowed if the participant has given explicit consent and only with the researcher present in the room. Should remote recording be desired, as amendment to this proposal and a new submission to the ERB will be required.
13	Description of the research population, exclusion criteria
	DIIGIM Design Projects (B2-P, FBP, MI- Design) Healthy adult participants Depending on the household sampled, we might include children in the studies. These will however always be interviewed in the presence of a parent, after consent has been obtained. Specific inclusion criteria are: - Adults aged 18 years or older that have a familiarity to the mundane characteristics that the specific design ultimately focuses on. - Fluent in Dutch or English language Exclusion criteria are: - Physical or mental maladies, or that prevent the participant from fully understanding of the consent form and

Ethical Review Form	
	Occasionally deployed prototypes will log (sensor data) (in-person or remote). This data will be used to inform the design process.
	Stimuli Prototypes might drive a design intervention which stimulates users to reflect on their decisions, choices and opinions, and other measurable behavior. In the case of speculative design, these prototypes may be deployed to stimulate users to reflect on their depth and progression on emerging technologies and phenomena.
	* I am NEVER allowed to make audio, still or video recordings of participants or households or any contact for design (e.g., through a deployed prototype). I am allowed to make audio, still or video recordings after consent and only with the student present and operating the recording equipment. Should this proposal be accepted, it must be amended in this proposal and a new submission to the ERB will be required.
15	Number of participants
	Sample size Qualitative methods (interviews, user testing, eco-audits, etc.) - 20-40 participants Quantitative survey methods - 20-50 participants
16	Explain why the research is socially important. What benefits and harm to society may result from the study?
	DIGSIM Design Project (BS-B2, FBP, MI-MR) DIGSIM & Social Design Research Projects (BS-B2, FBP, MI-MR) Designing for (growing) systems is the new frontier of engineering. The world is facing unprecedented challenges like IoT, machine learning, change the scope of design and art as well as "making" for design. At the same time, the world is facing major challenges at the horizon: impending climate change will have an impact on our environment and society, and global social inequality. In DIGSIM we look how to address these challenges by designing for the needs of the end-user. We aim to instrumentalize new and emergent technologies as agents of change. What's more, we want to find ways to design interventions that will solve all problems at hand, we do this by reflecting on the needs of the end-user and the people that affect it. Is there is the human-product interaction that can be improved?

Ethical Review Form	
TU/e ETHICAL REVIEW FORM OF TECHNOLOGY	
<p>platforms at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and no subjects will never be recognizable in publications, academic material or other documents.</p> <p>NB: data can only be stored on university approved platforms such as Microsoft 365, OneDrive, SharePoint, Drive, Dropbox, Slack, any other cloud-based tool.</p> <p>Finally, in quantitative studies, all individual results will be published, in conclusions will be made from the entire cohort's data. In qualitative studies, pseudonyms will be used to refer to specific participants and no real names or other data (e.g., quotes) can be linked to specific participants. The results will be published in reports, scientific conferences and published in scientific research journals, and on academic websites associated to TU/e.</p>	
Part 2: Checklist for Minimal Risk	Yes
1 Does the study involve participants who are particularly vulnerable or unable to give informed consent? (e.g. children, people with learning difficulties, patients, people consulting, people living in care, people recovering from mental health self-help groups)	X
2 Are the participants, outside the context of the research, a danger to themselves or others?	X
3 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 in non-public places)	X
4 Will the study involve actively deceiving the participant(s) (e.g. will participants be deliberately falsely informed, will information be withheld from them and will they be shown this in such a way that they may fail to object or show concern when deceived about this)?	X
5 Will the study involve disclosure or collection of personal data? (e.g. name, address, phone number, email address, IP address, BSN, national identity code) and will the study collect and store this data? (e.g. will the study collect and store personal data under pseudonyms, check the FAVO on the internet, ...). Please follow the guidelines. Make sure you perform a Data Protection Impact Assessment (DPIA) and make a Data Management Plan if necessary and/or the data manager checklist .	X*

Ethical Review Form	
3	<p>Participants: Participants are informed in the consent form about the collection of such data and it is declared that all (?) information is provided to them.</p> <p>Research data is anonymized and if necessary, pseudonyms are used to refer to participants. If necessary, the participants are made aware of the fact that the participants themselves have given the key to their data.</p> <p>Each participant can make arrangements for an electronic copy of the data that they have provided or that has been measured directly from them. The participant can request that the data be sent to them who can then complain to the Chief Information & Security Officer, the Privacy & Security Officer or the Data Protection Officer. The participant can also contact Data Protection Authority (privacy@rivm.nl) or contact the Dutch Data Protection Authority (www.dgp.nl). The participant will be present in all information sheet/consent forms.</p> <p>Nb. As we do not include any identifiable data in the research data they can only do this for the duration of the study, after that we cannot guarantee this.</p> <p>With regards to part 2: question 11. Our DGSIM design approach involves user testing physical prototypes by the students. While the reading devices are not CE certified yet, the students will be asked to test the device on the basis of the Rasperberg P, (b) ears head- and FFC models which is tested under supervision of the supervisor. The maximum rated voltage of the device is limited to 21V (DC or AC), all electronic prototypes will be approved by the lab. The approval is made by the supervisor and the student (or student in both square team (W.F.J. Westra) as well as staff from eLab. All test results are documented through email from the student to both square lead (Westra) as well as from staff eLab.</p> <p>3. Describe and justify the number of participants you need for your study. Justify the educational activity. Also justify the number of people you need, taking into account the risks and benefits</p> <p>Participants: Participants are informed in the consent form about the collection of such data and it is declared that all (?) information is provided to them.</p> <p>Research data is anonymized and if necessary, pseudonyms are used to refer to participants. If necessary, the participants are made aware of the fact that the participants themselves have given the key to their data.</p> <p>Each participant can make arrangements for an electronic copy of the data that they have provided or that has been measured directly from them. The participant can request that the data be sent to them who can then complain to the Chief Information & Security Officer, the Privacy & Security Officer or the Data Protection Officer. The participant can also contact Data Protection Authority (privacy@rivm.nl) or contact the Dutch Data Protection Authority (www.dgp.nl). The participant will be present in all information sheet/consent forms.</p> <p>Nb. As we do not include any identifiable data in the research data they can only do this for the duration of the study, after that we cannot guarantee this.</p> <p>With regards to part 2: question 11. Our DGSIM design approach involves user testing physical prototypes by the students. While the reading devices are not CE certified yet, the students will be asked to test the device on the basis of the Rasperberg P, (b) ears head- and FFC models which is tested under supervision of the supervisor. The maximum rated voltage of the device is limited to 21V (DC or AC), all electronic prototypes will be approved by the lab. The approval is made by the supervisor and the student (or student in both square team (W.F.J. Westra) as well as staff from eLab. All test results are documented through email from the student to both square lead (Westra) as well as from staff eLab.</p> <p>Online surveys to collect quantitative data will be disseminated to a limited period of time (no more than 2 weeks). No explicit limit is set to the number of participants volunteering to fill it out.</p>

Ethical Review Form	
<p>4 Will you share de-identified data (e.g., upon publication in a public repository)?</p> <p><input type="checkbox"/> No</p> <p><input checked="" type="checkbox"/> Yes. Participants will be informed about how their data will be shared and ask consent to share their data. Corrections will be made from the entire cohort's data, or pseudonyms are used to refer to individual participants. The data will be published in a report disseminated in scientific conferences and published in scientific research journals.</p>	
Part 5: Closures and Signatures	
<p>1 Enclosures (tick if applicable):</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Informal consent form <input type="checkbox"/> Informal consent form for other agencies when the research is conducted at a location such as a school; <input type="checkbox"/> Text used for ads (to find participants) <input type="checkbox"/> Text used for debriefing <input type="checkbox"/> Application to ethics committee; <input type="checkbox"/> Any other information which might be relevant for decision making by FERB. <input type="checkbox"/> Data protection Impact Assessment checked by the privacy officer <input type="checkbox"/> Data Management Plan checked by a data steward <p>2 Signatures:</p> <p>(Signature(s) of researcher(s) Date:</p> <p>Signature research supervisor (if applicable) Date:</p>	<p>This study will use the informed consent form approved by the University (https://tinyurl.com/ul3odzck). This item is in line with the new GDPR requirements.</p> <p>Signature students/researchers:</p>  <p>Signature project architect:</p>  <p>Signature squad leader:</p> 

User test 2 consent form

This is the consent form sent in advance to the office workers



Information form for participants

This document gives you information about the study "Ambient Office". Before the study begins, it is important that you learn about the procedure followed in this study and that you give your informed consent for voluntary participation. Please read this document carefully.

Aim and benefit of the study

The aim of this study is to measure how home workers respond to ambient sounds, an overview of their coworkers and easy access to video calls. This information is used to create a more tailored design for home workers to enhance their inclusiveness in the digital office.

This study is performed by Kay van den Aker, a student under the supervision of Bart Hengeveld of the Eindhoven University of Technology (TU/e).

Procedure

You will be given an app which you open on your phone next to where you work at home where you input your current availability for informal social interaction. It will be connected to your PC on which you open a website which will be used to start video calls with fellow coworkers. This data will not be stored. Your behavior with the artifact and social interaction with others will be observed throughout the day as you use the product to start calls, change your availability and listen to the ambient sounds.

Risks

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

Duration

The instructions and measurements will span approximately one work day, the prototype will be sent and explained the day before the test and the participant can start using it when they would normally start their work from home until they are done working for the day. After that an evaluation is held to talk about their experience with the product.

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 up to 24 hours after they were recorded. 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 and 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 (such as unidentifiable pictures) and experimental data (for example your behavior with the product) will be anonymized, recorded, analyzed, and stored. The goal of collecting, analyzing, and storing this data is to answer the research question and publish the results in the scientific literature. To protect your privacy, all data that can be used to personally identify you will be stored on a local computer for one week after the test and after



that at least 10 years on the university server which is only accessible by the researcher. No information that can be used to personally identify you will be shared with others.

No video or audio recordings are made that could identify you. The voice/video calls made throughout the day will not be saved or distributed. It will only be used to observe the behavior with the product.

Further information

If you want more information about this study, the study design, or the results, you can contact Kay van den Aker (contact email: k.v.d.aker@student.tue.nl)

If you have any complaints about this study, please contact the supervisor, Bart Hengeveld (b.j.hengeveld@tue.nl). You can report irregularities related to scientific integrity to confidential advisors of the TU/e.



Informed consent form

Ambient Office

- 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. 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 permission to use my data up to 24 hours after the data have been recorded.
- 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

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

Participant's Signature

Date

User test 2 ERB

This is the ethical review form for user test 1

Ethical Review Form (Version 27.06.2019)	TU/e UNIVERSITY OF TECHNOLOGY
<p>This Ethical Review Form should be completed for every research study that involves human participants or potentially identifiable data and should be submitted before potential participants are approached to take part in the research study.</p>	
Part 1: General Study Information	
1 Project title	Designing for Growing Systems in the Home
2 Researchers Name and researcher	K.van den Akker
4 Supervisor(s) 5 Faculty/department	K.V.K. Aderl@student.tue.nl - B.J.Hengeveld@tue.nl; Industrial Design
6 Research location	The Netherlands
7 Research period (start/end date)	February 2020 - July 2021
8 Funding agency	-
9 [If Applicable] Study is part of an educational course with code:	DFO003 Designing for Growing Systems in the Home
10 [If Applicable] Ethical Review already approved by external Ethical Review Board? Add name of approval, and contact details of the EERB	-
11 Short description of the research question	<p>The Designing for Growing Systems in the Home (DFO) project aims to develop and to design a squad that aims to explore the next frontier of design: <i>design research</i>. It is to familiarize students with a new approach to design research, one that is more design oriented than design research. This approach is designedly expert that actively tries to explore new approaches in design systems in terms of solutions and approaches.</p> <p>The semester long projects are characterized either as "design" projects or as "design research" projects. Both of these types of projects involve "student involvement" and this Ethical Review Form offers two generalizations of this involvement.</p>
DFO-Design Projects (B2-P2, FBP, MI-Design)	

Ethical Review Form	
<p>design proposal as well as to surface (potential) issues and concerns to identify the qualities of the design. This is done through (consent of):</p> <ul style="list-style-type: none"> • all participants • (consent) data logging (in-person or remote) • diary studies • semi-structured interviews • (online) surveys • home observation • audio or video recording. <p>Additional or alternative user involvement: Occasionally user researchers suggest that students occasionally deviate from the planned course of in-home deployments. These deviations follow the following steps:</p> <p>Additional:</p> <ul style="list-style-type: none"> • user studies with follow students • Alternative when failing altogether to implement the in-home deployment - <i>undesired scenario:</i> o consider alternative user involvement <p>(3) Consolidation: The data from the deployment activities and the user research (including the proposed) is created based on the insights from the analysis.</p> <p>User involvement: Occasionally students opt for additional user involvement in the consolidation phase prior to the final iteration of the design. This final iteration of the design proposal. This is done through:</p> <ul style="list-style-type: none"> • usability studies with follow students • usability studies with the original families of the in-home deployment • expert panel (internal or external experts) <p>ob. is NEVER allowed to make verbal audits, still to take notes and to take photographs or any form of contact for design (e.g. through a deployed prototype). Audio, photo or video recording is only allowed if the user has given explicit consent to present and report the recording equipment. Should there be any questions, a submission to the ERB will be needed.</p>	<p>ENDOWED CHAIR OF TECHNOLOGY</p> <p>INSTITUTE FOR DESIGN AND TECHNOLOGY</p>
<p>Design & Design Research Projects (B2-P3, FRP, MScResearch)</p>	

Ethical Review Form	
	<ul style="list-style-type: none"> • Children under the age of 6-years-old <p>Informed consent will be sought from all participants. Without explicit signed informed consent, no data can be taken.</p>
	<p>DISGIM Design Research Project (B2-P2, FDP, MI-Research)</p> <p>Healthy adult participants.</p> <p>Depending on specific research questions, we might include children in research. They will however always be interviewed in the presence of a parent, after consent has been obtained.</p>
	<p>Specific inclusion criteria are:</p> <ul style="list-style-type: none"> • People that represent the target-group that is relevant for the research question. • Patient in either Dutch or English language
	<p>Exclusion criteria are:</p> <ul style="list-style-type: none"> • People with specific impairments limiting participation in the studies, or their understanding of the consent form and procedures. • Children under the age of 6-year-old <p>Informed consent will be sought from all participants. Without explicit signed informed consent in place, no data can take place.</p>
14	<p>Description of the measurements and/or stimuli/elements</p> <p>Design Design Design Project (B2-P2, FDP, MI-Research)</p> <p>DISGIM Design Research Project (B2-P3, FDP, MI-Research)</p> <p>Self-reported data*</p> <ul style="list-style-type: none"> • Description of daily experiences with or without deployed prototypes • User experience questionnaires • Usability questionnaires <p>Recorder-collected data*</p> <ul style="list-style-type: none"> • Video or audio recordings of interviews • Transcripts of interviews • Photos (with people (not recognizable people)) <p>Sensor-collected data*</p>

Ethical Review Form	
17	<p>The benefits are clear: what do we know about new methods for design and how to use them in system design? What are the potential risks? We will also inform by an end-user perspective. Finally, that means as a research project, we will have to design challenges.</p> <p>We expect this to be a multidisciplinary effort, but at the same time see the benefit of knowing where not to look.</p> <p>This study involves minimal risks for the participants. Participants will not be exposed to dangerous or distressing situations. The study will begin after the start of the study. The researchers will have access to all personal information of the participants, who can decide to share their results at any moment.</p> <p>Only (if involved) will always be interviewed in the presence of a parent, after consent has been obtained.</p> <p>Questionnaire data includes only low risk information with results being only presented in aggregate. Hence, we expect no risks from the questionnaire.</p> <p>Interviews and observations conducted within our research-through-design approach will be focused exclusively on the usage and experience of using the prototypes. Participants will receive no personal information, as mentioned to this proposal and a new submission to the ERIH.</p> <p>Additionally, the tasks will be asked from participants in order to structure evaluations and tests will be set such that they do not deviate from regular sentence structures. The design of the questionnaires and design can form an exception here because they can be designed to elicit responses in certain ways (i.e., when a design provokes or disrupts an attention to this proposal and a new submission to the ERIH).</p> <p>Self-reported (collected via user research methods). Researcher collected or sensor data will be coded and anonymized. All data will be stored in a database will be kept by a password of protected academic online.</p>

Ethical Review Form		Ethical Review Form	
Will participants be asked to discuss or report sexual experiences, religious, alcohol or drug use, or suicidal thoughts, or other topics that are highly personal or intimate?	<input checked="" type="checkbox"/>		
Will participants in the research be burdened? (e.g. requiring participants to wear a device 24/7 for several weeks, to fill in questionnaires for hours, to travel long distances to research locations, to be interviewed multiple times)?	<input checked="" type="checkbox"/>		
May researchers procedure cause harm or discomfort to the participant in any way? (e.g. causing pain or more than minor discomfort, stress, anxiety or by administering drinks, foods, drugs)	<input checked="" type="checkbox"/>		
Will blood or other (bio)samples be obtained from participants (e.g. also external imaging of the body)?	<input checked="" type="checkbox"/>		
Will financial inducement (other than reasonable expenses and compensation for time) be offered to participants?	<input checked="" type="checkbox"/>		
Will the experiment involve the use of physical devices that are not "CE" certified?	<input checked="" type="checkbox"/>		
Important: If you answered "yes" to any of these parts 1-4, go directly to part 5. Check which documents you need to endorse and continue with signature or submission. If you answered no or more questions with "yes" , please continue with parts 3 - 5.			
Part 3: Study Procedures and Sample Size Justification			
Elaborate all boxes answered with "yes" in part 2. Describe how you safeguard the rights of the participant.	<p>With regards to part 1, question 1: Children (if involved) will always be interviewed in the presence of a legal representative (parents, guardians), after informed consent has been obtained. Confidentiality will be maintained by recording research and user tests with children will be followed.</p> <p>With regards to part 2, question 3: We consistently distinguish between research data and participant data. Research data is data that is necessary for the study and will never contain personally identifiable data; this data is stored on a password-protected computer system and is encrypted. Participant details is data that is necessary to keep the study (controlling information), this is stored locally by the researchers in a password protected excel sheet. All data is stored on a password-protected computer. Participants details will never be shared with third parties. The researcher will be present during all sessions.</p> <p>With prior and explicit consent, research data can include pictures, video of the sessions (e.g. interviews). Videotaping will be taken during the process of the interview. This will be stored in a folder on the computer of the researcher.</p>		
Part 4: Data and Privacy Statement			
I	<p>Eglish whether your data is completely anonymous, or if it will be de-identified (pseudonymized) or anonymised and explain how</p> <p>The subject research has no real personal identifiers, data as research data is conceptually approached from participant details. Research data will be identified by random number and/or pseudonyms only in case of a follow up study these names will be removed. Personal data such as name, address, password protected files as the participants details for the duration of the study and will be destroyed after the study has ended. The researcher will inform the participants about the removal of their pseudonyms so that the participants themselves have the key to the pseudonyms.</p> <p>The research data will be kept on a password-protected academic storage platform at the Eindhoven University of Technology. All the participants details collected during the study will be processed confidentially. All data will be stored in a password-protected folder that can only be recognized in publications, academic material or any other means.</p>		
2	<p>Who will have access to the data?</p> <p>Only the main applicants, squad coaches and coaches with access to the data.</p> <p>No</p> <p>I, and I declare, I will follow the general data protection regulation (GDPR).</p> <p>The research data does not contain identifiable data and will be retained for a period of maximum five years for renewal requests or projects. For projects that lead to a publication, the researcher will be responsible for the removal of the data. The researchers do not have any means to connect the research data to the participants. For this reason, participants can only ask for their data to be removed if they want to. Whether the removal of individual participant this depends on two factors: (1) the study was set up to keep the data for a longer period of time, (2) the researcher, (2) the study is ongoing. Participants will be informed about this.</p> <p>Data protection is guaranteed by the researcher through access to unauthorised persons, keeping data against unauthorised processing or accidental loss of data.</p> <p>For the duration of the study, the researcher will store the researchers for an electronic copy of the data that he has provided of that research. This data will be stored in a password-protected folder. During the study, see previous paragraph. If they are dissolved with data privacy is handled, they will submit a complaint to the Dutch Data Protection Authority (Dutch Data Protection Authority) and/or the Data Protection Officer of the Eindhoven University of Technology via privacy@utw.edu or contact the Dutch Data Protection Authority.</p>		
3	<p>Will you store personal information of the research participants to be identified from their data? See V3B9I state</p> <p>No</p>		


Eindhoven University of Technology

Ethical Review Form

12 Description of the research method	<p>Design projects are set around mundane characters (fiktional 'persons' 'living' in a scale model of a house (the IoT Sandbox) and revolve around human needs such as: comfort, safety, energy use in the home, everyday experience, good quality sleep sometimes with company (e.g., Asperger's syndrome stakeholders) (cf., United States of Nansen).</p> <p>DIGISM Design Research Projects (B2-P2, FBR-MI)</p> <p>Design research projects are centred around research questions originating from members of the DIGISM squat. There are two types of them infrom these questions: (1) practice theory in the context of design research, (2) design research approaches to designing for systems, (3) design tools and applications for design research methods for designed products in growing systems.</p> <p>13 DIGISM Design Projects (B2-P2, FBR, MI-Design)</p> <p>Design phases of user involvement: The DIGISM Design Projects are based on:</p> <ol style="list-style-type: none"> (1) Conceptualization: students engage with the design problem by means of identifying mundane characters in the IoT Sandbox. Mundane characters are elaborated and might be informed by 'user' input. This phase is the experiential (working) prototype of the design problem. User involvement: In the conceptualization phase students identify the mundane characters, and through those, their design project by means of qualitative and quantitative research methods. This phase is the first iteration. This is done through (combinations of): <ul style="list-style-type: none"> (contextual inquiry) (semi-structured) interviews day in the life home observation (2) Evaluation: students evaluate their prototypes and aim to generate insights towards improving their design project. This phase is the second iteration. User involvement: The design proposal is displayed in the IoT Sandbox for up to a week. The aim for this deployment is to: <ul style="list-style-type: none"> • receive feedback from the users • receive feedback from the stakeholders
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The DFG/ESRC design research projects follow different design research approaches that employ qualitative and quantitative research methods or combinations thereof.

Design through design approach

Design through design means to do research with. Typically, a small number (1 to 4) of prototypes is made to support a design research study with a group of users. Methods include:

- interviews
- (sensor) data logging (in prototype or remote)
- diary studies
- (structured) interviews
- (online) surveys
- home visits
- usability studies

ob. It is NEVER allowed to make remote audio, still or video recordings of people without their knowledge or consent (e.g. through a telephone or proxy). Audio, photo or video recording is only allowed if it is part of the design process. If a participant present and operating the recording equipment should be asked whether this is desired, an amendment to this proposal and a new submission to the ERB will be needed.

13 Description of the research population, exclusion criteria

EU Design Project (FDZ-FB1, M1-Design)

Healthy adult participants

Depending on the household sampled, we might include children in the households. They will however always be excluded from the presence of a parent after consent has been obtained.

Specific inclusion criteria are:

- Male and female adults who have a similarity to the mobility characteristics that the specific design challenge focuses on.
- Fluency in German and/or English language

Exclusion criteria are:

- Physical or mental impairments limiting participation in the studies, or their understanding of the consent form and procedure.

Ethical Review Form	
	<p>Occasionally developed prototypes will log (sense) data (in prototype or remote). This data will be used to inform the design process.</p>
	<p>Stimuli Prototypes might deliver a design intervention while simultaneously collecting data. This may include choices and opinions, and other measurable behaviors by the user. The researcher must ensure that this is definitely provocative in order to generate a depth reflective on emerging technologies as phenomena.</p>
	<p>* It is NEVER allowed to make remote, still or video recordings of participants or households or any other location without explicit permission from the prototype. Audio, photo or video recording is only allowed if it is part of the design intervention, present and operating the recording equipment. Should remote recording be desired, an amendment to this section and a new submission to the TEB will be needed.</p>
15	<p>Number of participants</p> <p>Sample size Qualitative methods (interviews, user testing, (co-creation) workshops) between 4-12 participants are acceptable. Quantitative methods (surveys, experiments) require a minimum of 30 participants.</p> <p>DIGIMIS Design Projects (B2-P2, PBP, M1-Design)</p> <p>DIGIMIS Design Research Projects (B2-P3, PBP, M1-Research)</p> <p>Designing (or growing) systems is the new frontier of design. In this field, we are not only interested in how big machine learning change the face of design, but are ill-understood as "meatballs" for design". At the same time, the field of design research is changing at the horizon, becoming a climate change in society and an environmental concern. DIGIMIS work is located at the intersection of these two fields. We are looking for people who are interested in the challenges and the eyes of the end-user. We aim to instrumentalize new and emergent technologies as agents of change. While we are open to all kinds of projects, we are particularly interested in projects that will solve all problems at hand, we do however believe that the best ideas come from that people at it is there the human-product interaction.</p>
16	<p>Explain why the research is socially important. What benefits and harm to society may result from the study?</p>

	TUE Eindhoven UNIVERSITY of TECHNOLOGY	
Ethical Review Form		
	<p>platform at the Eindhoven University of Technology. All the personal data collected during the study will be processed confidentially and no subjects will be identified. The data will be used for publications, academic material or any other reason.</p> <p>Finality: In quantitative studies, no individual results will be published, as conclusions will be made from the entire sample. In qualitative studies, pseudonyms will be used to refer to specific participants and care will be taken that no data (e.g., quotes) can be traced back to the individual.</p> <p>Results of this study may be disseminated in scientific conferences, via presentations, in academic journals, and on academic websites associated to TUE.</p>	
	Part 2: Checklist for Minimal Risk	
	Yes	No
1 Does the study involve participants who are particularly vulnerable or liable to give informed consent? (e.g. children, people with learning difficulties, patients, people experiencing depression, people living in care / nursing homes, people recruited through self-help groups)	X	
2 Are the participants, outside the context of the research, in a dependent or subordinate position to the investigator (such as own children or own students)?	X	
3 Will it be necessary for participants to take part in the study without their knowledge and/or against their will?	X	
4 Will the study involve actively detecting the participant(s) (e.g. will participants be deliberately falsely informed, will information be withheld from them or will they be misled in such a way that they are likely to object or show unease when debriefed about the manipulation)?	X	
5 Will the study involve disclosure or collection of personal data (e.g. name, address, phone number, email address, IP address, BNIN number, location data) or will the study involve the collection of sensitive personal data (e.g. religious beliefs, sexual subjects)? Please check the FQ or the ITR if yes; then provide the gazezeur. Make sure you perform a Data Protection Impact Assessment (DPIA) and make a Data Management Plan if necessary and file the DPIA checklist .	X*	

<p>Ethical Review Form</p> <p>(Participants) Participants will be informed in the consent form about the collection of such data and it is declared that all (1) information is optional to provide.</p> <p>Research data is anonymised and if necessary pseudonyms are used to protect the participants. If necessary, the participants are made aware of these pseudonyms so that the participants themselves have the possibility to withdraw.</p> <p>Each participant can ask the researchers for an electronic copy of the data that they have provided or that has been measured directly at them. If they are dissatisfied with the data privacy is handled, they can contact the Data Protection Officer, the Privacy & Security Officer, the Privacy & Security Officer and/or the Data Protection Officer of the Endovenous University of Technology or the Data Protection Officer of the Dutch Data Protection Authority. This contact information will be present in all information documents.</p> <p>Yes, we do include any identifiable data in the research data they can only do this for the duration of the study, after that we have no longer any means to connect participant to their data.</p> <p>With regards to part 2, question 11: Our DGSIM design specifies that the prototypes will be approved by the students. While the resulting devices are not yet certified per se, the prototypes will be tested and evaluated by the students (e.g., Raspberry Pi, etc.) before CE and FCC marks which is tested and certified to comply with the EU directives. Furthermore, the output values of the prototypes will be checked by the students. The prototypes will be approved by the students. The approval is made by the students themselves. The students will both sign under Q.W. Ferri as well as staff from lab. It is also required to receive approval from the supervisor of the student to be handed over to the student (Q.W. Ferri) as well as staff from lab.</p> <p>The sample size for qualitative studies mainly depends on the complexity of the data. In this study, we will involve approximately 4-12 participants when using qualitative methods.</p> <p>Online surveys to collect quantitative data will be disseminated through social media. The survey will be open for a limited period of time (no more than 2 weeks). No explicit limit is set to the number of participants volunteering to fill it out.</p>	<p>Ethical Review Form</p> <p>4 Will you share de-identified data (e.g., upon publication in a public repository)?</p> <p><input type="checkbox"/> No <input checked="" type="checkbox"/> Yes. Participants will be informed about how their data will be shared and ask consent to this data. Conclusions will be made from the entire cohort's data, or pseudonyms are used to refer to individual participants. These conclusions will be disseminated in scientific conferences and published in scientific research journals.</p> <p>Part 5: Closures and Signatures</p> <p>1 Enclosures (check if applicable):</p> <p><input type="checkbox"/> Informed consent form <input type="checkbox"/> Informed consent form for other agencies when the research is conducted at a location (such as a school) <input type="checkbox"/> Test used for (not) finding participants; <input type="checkbox"/> Test used for (not) screening participants; <input type="checkbox"/> Approval other research ethics committee; <input type="checkbox"/> Any other information which might be relevant for decision-making (FIR); <input type="checkbox"/> Data Protection Impact Assessment checked by the privacy officer; <input type="checkbox"/> Data Management Plan checked by a data steward</p> <p>2 Signature(s)</p> <p>Signature(s) of researcher(s) Date:</p> <p>Signature research supervisor (if applicable) Date:</p> <p>This study will use the informed consent form approved by the University (https://www.endovenous.com/ethics/decided/). The form is in line with the new GDPR requirements.</p> <p>Signature students researchers: </p> <p>Signature project coach: </p>
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Credits: While filling in this form we have made use of the work of Carine Lallemand who kindly shared a template form that was approved by the ERB previously.