CHALMERS
UNIVERSITY OF TECHNOLOGY

FOCUS

A Workspace Concept for Home

Master's thesis in Industrial Design Engineering

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Master of Science Thesis

Focus

A Workspace Concept for Home

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ABSTRACT

We got in contact with Abstracta AB, a company that focuses on office furniture with acoustic properties, mainly sound absorbers and diffusers. They saw a potential opening in the market for people who will start to work part-time from home.

Through our research we found that, in the future, a majority of people who worked from home during the Covid19 pandemic will not continue to work full-time from home. They will probably work from home two days a week, that is, 16 hours per week. How can we create a pleasurable workspace at home for those 16 hours that will not compromise the living space at home for the other 152 hours?

By talking to people working from home about their experiences, challenges and benefits we sought to get a deep understanding of how working from home has and will affect people in the future. Our research was based on literature, interviews, workshops, user testing and other methods to truly understand people's experiences. Using these insights, we designed a concept furniture with the goal of improving the working environment at home, decreasing the impact of having a workspace when not in use and fitting the product line of Abstracta's catalogue.

Through a sprint process with a service design mindset we have developed a foldable workspace called Focus. Focus is a foldable workstation that combines many qualities that make a good workspace such as height adjustment, integrated lights, sound dampening, outlets, cable management, storage capabilities and the ability to be moved. It can also be closed to hide the visuals cues of work and become smaller, resulting in less use of physical space and reduced visual salience when not in use. Working from home is here to stay and new products are needed to improve the conditions for good work life balance. The market is largely unexplored and there are many opportunities for improving the user's experiences.

Keywords:
Work from home, WFH, productivity, work conditions, focus, acoustics

CONTENTS

1. INTRODUCTION

During the Covid-19 pandemic, the people who could started working from home (WFH) in Sweden. Since no one knew how long the pandemic would last, kitchen tables, ironing boards and sofas became work places since it was seen as temporary. Poor conditions for working might be acceptable for a limited time, but the pandemic was ongoing for over a year.

Now, as the pandemic is fading away and is no longer regarded as a danger to society in Sweden, we can learn from how people worked and improve WFH. According to studies by Kantar Sifo (2020) 9 of 10 who have worked from home want to retain the ability to keep doing so in the future.

This project investigated the working conditions in people's homes and the possibility to design a product that addresses existing problems and enriches the experience of working from home. The home is an intimate part of a person's life which has to be accounted for when trying to design for WFH.

Research on WFH was sparse, other areas such as work environment was useful but mainly focused on office environments. We wanted to design for people in Sweden primarily and did so through a human-centered design approach.

1.1 Background

This project was conducted at Chalmers University of Technology in collaboration with Abstracta AB. Abstracta is a manufacturer of high-end acoustic furniture. Today they offer many different solutions, mostly furniture with integrated acoustic characteristics such as lamps, sofas and sound-absorbing screens. They sell products to a wide variety of customers ranging from hospitals and restaurants to offices and schools.

According to the project brief (Appendix 1), Abstracta have seen an increased demand for their products to be used at home. The shift in the working environment opens up a new market for WFH furniture, which is why this project was initiated.

1.2 Purpose and goal

The purpose of this project was to improve the physical environment for remote work at home. To achieve this, we needed to acknowledge that every home is unique, people have different preferences and the design needs to accommodate these differences.

Working two days a week from home, 16 hours, is 40% of the working time. Having poor conditions for that time is not sustainable. Our goal was to make working from home pleasurable while maintaining, or increasing, perceived productivity.

The goal for the final concept was to include acoustic enhancing properties and be possible to manufacture and sell. This was to satisfy Abstracta's needs.

1.3 Limitations

Abstracta is designing and manufacturing furniture, that is why this project was focused on designing a piece of furniture or a collection of furniture (we will not create a complete room). We have focused on developing a solution for people in Sweden who work with a computer at a desk from home. We have therefore not focused on people working as field technicians, people doing customer visits or people working with non-digital applications. The concept had to be possible to manufacture but the concept did not need to be finalized for manufacturing purposes.

1.4 Research questions

The following questions were our preliminary questions based on the project brief (Appendix 1) we were given from Abstracta.

- What are the main problems regarding working from home?
- What causes these problems?
- How can we solve a current problem by creating something that fits the project brief?

2. PROCESS

Our process was based on Knapp, Zeratsky and Kowitz (2016) Sprints which we combined with Stickdorn, Hormess, Lawrence and Schneider's (2018) Service Design principles.

Sprints are used to impose deadlines and learn from each mistake and success. A sprint is essentially a small scale project that spans about three weeks and includes the phases information, ideation and finalization. The sprint will also start in an exploring mode of ideas and possibilities that will be filtered down to one or perhaps a few concepts at the end of the sprint.

Service design is used in order to think about what service we can provide people with rather than exploring a physical artefact that would fit user needs. Stickdorn et al. (2018) have listed principles for service design that we agreed with and wanted to stand by, which follows:

- Consider the experience of all people affected by the service.
- Stakeholders of various backgrounds and functions should be actively engaged in the service design process.
- Service design is an exploratory, adaptive, and experimental approach, iterating toward implementation.
- The service should be visualized and orchestrated as a sequence of interrelated actions.
- Needs should be researched in reality, ideas prototyped in reality, and intangible values evidenced as physical or digital reality.
- Services should sustainably address the needs of all stakeholders through the entire service and across the business.

With this combination we could explore freely within each sprint while not wasting time. Firstly, by following the Service design principles our research would be connected to reality. Secondly, if some exploration would come to a dead end, we would evaluate it and learn from it. The route to a dead end will still provide knowledge.

Design is often messy and this is by no means a linear process. As seen in Figure 1, the sprints were more overlapping spaces than singular tasks. By having certain steps that needed to be accomplished in a sprint we could be productive and efficient. At the end of each sprint, we reviewed our process, what went right, what went wrong, how we could improve and what we needed to do in the next sprint.

By repeating this process we wanted to build the next sprint with the knowledge and insights from the previous ones. By the end of the third sprint, we hoped to be confident in our ability to understand the customer needs and other factors that were essential to the success of the project. From there we focused on an idea with a lot of potential and properly developed it into a viable and well-executed concept.

2.1 Information

Research activities was ongoing throughout the whole project. There will always be something that can be researched whether it will be about different materials, shapes, user needs or product development theories. Research and collecting data will not generate conclusions and relevant findings by itself, the findings will need to be analyzed in various ways to be useful. Through analyzing collected data we could adapt our work and understand what to prioritize.

2.2 Ideation

Ideation was the creative phase in each sprint of the project. Ideation is about generating ideas and organizing them in a helpful way in order to view problems as solutions yet to be solved. The ideation process is based on different steps to go from the embryo of an idea to a full concept.

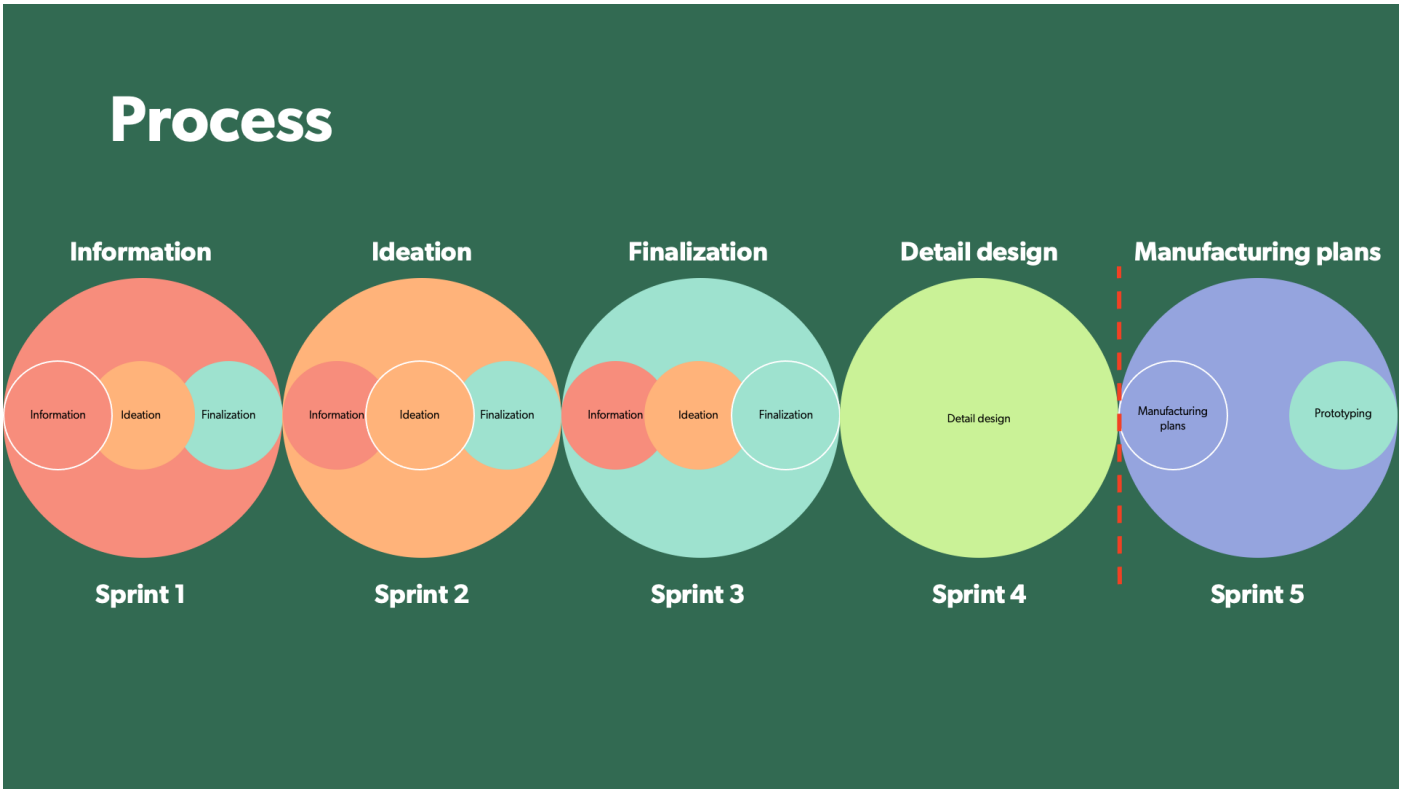
2.3 Finalization

Finalization was where the ideas from the ideation phase were evaluated against the research in the information phase of the sprint. Finalization is a reflective phase and works as the transition from one sprint to the next. This phase can also work as the analytical space to redefine the chosen concepts from the ideation.

2.4 Detail design

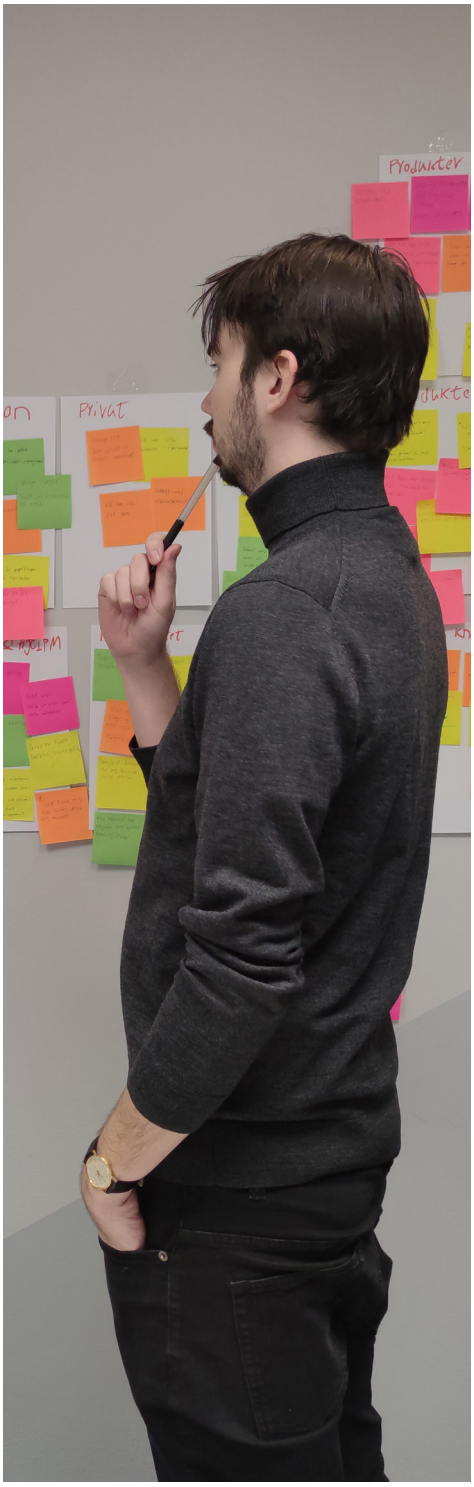
Detail design was the last sprint in which we had a final concept and defined the details. This is needed to decide what the design would be made of, how it would work and somewhat adapted to how it could be manufactured. If this project were to continue, the next phase would be to decide manufacturing plans and assembly.

Figure 1
Our process



3. SPRINT 1

In the first sprint we dove into the project without knowing what problem areas we needed to focus on. We saw this sprint as an exploratory process that would lay the foundation of future sprints. The purpose of Sprint 1 was to gain insights and knowledge by doing a literature review and conducting interviews, generating relevant questions and finding user needs for further sprints. This was done by analyzing our findings, identifying target groups and their specific needs and evaluating current WFH environments.



3.1 Literature review 1

The purpose of the first literature review in this project was to further understand the project brief. We researched focus, what might interrupt people's focus and what properties that can be used in an environment to enhance focus. Due to the collaboration with Abstracta who works with acoustics, we also deemed it appropriate to explore sounds in regard to WFH. We looked into this in order to create a concept later in the project which would positively affect acoustics and not negatively affect focus.

3.1.1 Research questions

The literature review was started off by specifying sub-questions to our initial research questions and from these we decided on search terms that would present relevant literature. The sub-questions for the first literature review were:

- What is focus?
- What is the difference between productivity and focus?
- How does noise affect focus?
- How does the auditory environment affect behavior?
- What do people think about working from home?

3.1.2 Methodology

This literature review was done as explained by Milton and Rodgers (2013) who divide it into four steps; issues, literature search, literature evaluation and analysis and interpretation. Firstly, the primary issues that are being looked into should be described and their area of relevance. Associated issues might also need to be explained. Secondly, search for material relevant to the subject and from the found material, evaluate the most valuable sources. Lastly, the explanation of the major findings and conclusions from the reviewed material need to be documented.

To find material to answer the research questions the search terms were:

- Focus AND concentration AND attention
- Interruptions AND distractions AND disruptions
- Office AND productivity
- Auditory environment
- Working from home WFH

We have searched for these terms in the Luleå University of Technology's library service called EBSCOhost. The EBSCOhost service searches multiple databases. The findings were evaluated in multiple steps, firstly the sources whose titles did not indicate some relevance for this project were excluded. In a second step of evaluating the remaining 53 findings we read the abstracts; the abstracts that did not seem to cover enough relevant information for this project were removed. The remaining 16 sources were read, interpreted and presented.

3.1.3 Results

Focus

Osvalder and Ulfvengren (2015c) explain focus in terms of the focus of the consciousness or the activity of short-term memory (STM). They further write that the STM is a memory for the present, it is used to temporarily store information, it is active when the conscious impressions from the senses are processed and when trying to solve a problem. The STM contains information that we are currently conscious of or just previously were. If information in the short-term memory is not repeated it is only available for about 30 seconds. Some information, however, is stored in the long term memory. Moreover, active information in the short-term memory can easily be disrupted by new information from the senses. Emotions and stress affect the capability of the STM, this can cause the STM to be overloaded and thus not store incoming information in the long-term memory (Osvalder & Ulfvengren, 2015c).

Focus differs from attention which is, according to Osvalder and Ulfvengren (2015b), what distributes a person's mental resources in a given situation. If our mental resources are distributed to multiple things we receive less quality of what is going on around us compared to distributing the mental resources to fewer things. However, they explain that a person's attention can be directed towards what the person deems to be most important. The key properties of attention are to focus on certain stimuli and disregard other stimuli. Another term, vigilance, also known as wakefulness, is about maintaining attention for a longer period of time.

Attention can either be selective or distributed. Selective attention, or directed attention, is about using the mental resources to focus on one specific thing (Osvalder & Ulfvengren, 2015b). Distributed attention is about using information from more than one source simultaneously and not jeopardizing the quality of either source. Some sources of information cannot, or are very difficult to, combine. It is generally easier to combine sources of information if they are received as different stimuli (Osvalder & Ulfvengren, 2015b).

Productivity

Two studies suggest that 25 - 30% of people who worked full time from home during the pandemic perceived themselves as less productive (Reuschke & Felstead, 2020), (Kantar Sifo, 2020). An equal number perceived that they were more productive. The expressed reasons for the lower productivity were low motivation, children at home, limited resources from the employer and a limited ability to interact with others (Yang et al., 2021). Dull and repetitive work tasks reduce productivity by 6-10% (Dutcher, 2012).

Having a separate room dedicated to work in the home has been shown to be positively related to perceived productivity and can allow workers to separate between personal life and work (Yang et al., 2021). This separation suggests that it is easier to get immersed in the work. Several studies have shown that people tend to experience a blurred balance between work and life (Bellmann & Hubler, 2021), which would decrease productivity but also lead to work role stress (Darouei & Pluut, 2021). A study conducted by Internetstiftelsen showed that 19% experienced that they worked more hours from home than at the office (Internetstiftelsen, 2020).

Another factor that affects perceived productivity is environmental comfort, which does not always lead to productivity but is a requirement for it (Kaushik et al., 2021). Environmental comfort is based on thermal comfort, air comfort, visual comfort, acoustic comfort and office layout (Nicol & Humphreys, 2002). Both warm and cold temperatures have been shown to decrease work related performance (Vimalanathan & Thangavelu, 2014).

Good lighting conditions have also been shown to have a positive correlation with productivity. As daylight affects our biological clock and hormones it is a major physiological factor (Hailu et al., 2021). It has also been shown that humans prefer natural light to artificial since natural light covers a wider spectrum of color (Kaushik et al., 2021). Low illumination stimulates the secretion of melatonin hormones that affect our alertness and performance (Kaushik et al., 2021).

Noise

The most common effect of noise, i.e. unwanted sounds, is being distracted and experiencing discomfort according to Bohgard et al. (2015). They further explain that not only does loudness, frequency and variation over time affect how someone experiences noise but also the meaning, predictability, control of and attitude towards the noise. Humans have the ability to adapt themselves to noise if it is low (in loudness), the adaptation can increase for about a week. People with impaired hearing get more distracted by high (in loudness) noise (ibid.) because of their heightened threshold for sounds, audible noise is experienced as louder.

Not only do unwanted sounds affect current work, aftereffects such as mental fatigue and decreased motivation to perform are also an issue even if there is no apparent effect during the work (Bohgard et al., 2015). Low frequency sounds, that is frequencies between 20 to 200 Hertz (Hz), can cause fatigue and drowsiness but also be distracting when working with focus demanding tasks according to Jakobsson and Skoglund (2017). Ventilation systems and heavy traffic can cause noise within these frequencies. Sudden noise is more harmful than consistent noise, often because they happen so fast that humans cannot shield themselves from them (Jakobsson & Skoglund, 2017).

The demand of WFH

"An efficient and healthy working environment is essential and fundamental for the occupants to work efficiently and be productive"
- Kaushik et al. (2021)

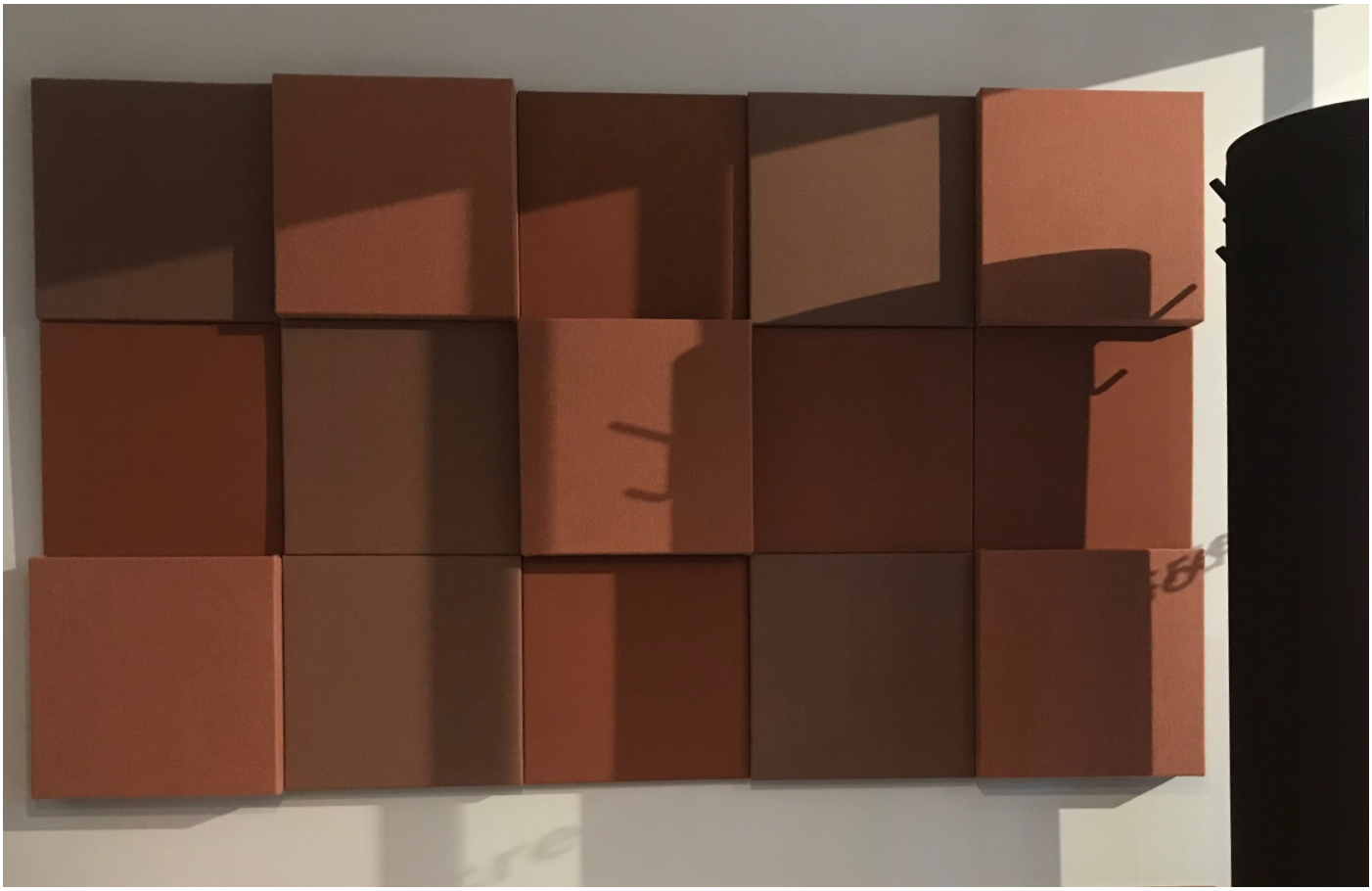
The amount of people working exclusively from home in the US rose from 8.2% in February 2020 to 35.2% in May 2020 (Yang et al., 2021). Studies have shown that employees did not want to go back to working from home full time (Williamson et al, 2020) and 81% of Swedes working from home wanted to retain the ability to work from home according to Internetstiftelsen (Internetstiftelsen, 2020). Even before the Covid-19 pandemic the trend of working from home was on the rise. A study showed that between 2005 and 2015 regular telecommuting increased by 115% in the US (Kaushik et al., 2021). A survey published by Randstad showed that 19% wanted additional support from their employer for home work and 77% of those answered that they wanted a better physical work environment (Kantar Sifo, 2020).

3.1.4 Conclusions

Focus is the activity of the STM and the capacity to transfer relevant information to the long-term memory and disregard irrelevant information. Productivity can be seen as what the STM and attention are directed at, perceived productivity is correlated with vigilance which is maintaining attention for a longer period of time.

The most distracting and harmful type of noise is sudden loud sounds, but consistent noise may cause low motivation in the long term.

An optimal environment for WFH should not be too exciting, generate too much input to the senses, cause stress and negative emotions or have poor physiological properties. A poor environment can cause stress, annoyance and discomfort which may result in low motivation. There are also five factors that affect environmental comfort which is a prerequisite for productivity. These are thermal comfort, air comfort, visual comfort, acoustic comfort and layout. Layout can be considered to be the location of the desk in relation to its environment. Generally, it seems that people are positive about WFH.



3.1.5 Discussion

The STM works best in our favor when we only get the input needed to complete a task and are not negatively affected by stress or emotions. This can be avoided by designing non-complex systems that work without introducing annoyance. Distributed attention (Osvalder and Ulfvengren, 2015b), is using information from multiple sources simultaneously without jeopardizing the quality of either source. The more spread out our attention is, the less quality we receive from each input. This is probably correlated with what type of inputs and what task a person is currently involved with.

We were still unsure of whether people experience noise when working from home and if so, what type of noise. The research questions we did not find an answer to in this literature review are what noises are most distracting when working from home and what noises are more prone to happen at home as opposed to an office. This would have to be further investigated.

The future dynamic of how people will work was still unclear, but it seems that people want to have the ability to work from home in the future. An effect of this might be that employers will cut down on office space. There seemed to be both positive and negative aspects of working from home and the future of this dynamic was taking shape right now.

How the home environment affects the working conditions of an employee was hard to conclude at this point. There is a lot of research on this subject but only in office environments. The home does in this context serve multiple purposes, as being able to relax but also provide good working conditions.

3.2 Interviews

"If you want to find out more about how people live/use a product, just talk to them directly"
- Milton and Rodgers (2013)

With cultural differences and values in mind, some of the information from the literature review may not apply to the Swedish work culture. Let us say for the sake of argument that a study showed the ideal working conditions in a middle eastern office, would it still be applicable in Sweden? At home? We decided that interviews would be helpful to find issues and get to know in detail how it is to work from home in Sweden.

From the literature review we learned that noise can be distracting, but what noises occur when working from home? People want to keep working from home in the future but to what extent, how frequently? But most important, what are the biggest issues when working from home?

3.2.1 Research questions

- What are the issues when working from home?
- Is it better to WFH?
- What noises occur at home?
- How frequently do people want to WFH?
- Are there a group of people that experience a unique issue when working from home?

3.2.2 Methodology

Conducting interviews
We conducted 11 interviews with people who had been working from home during the pandemic to learn more about their experiences. The participants were people that had been working from home during the pandemic but at the time of the interview had partially started to work in their office again. The interviewees consisted of 7 men and 4 women, mainly between 40 and 60 years old, however, three of the men were between 25 and 30 years old.

To decide on interview questions, we used a mind map to structure our thoughts regarding what we wanted to know.

This resulted in four major themes; equipment, productivity, environment, and the future. For the analysis of the interviews we recorded them and therefore did not have to take notes during the interview. Not taking notes allowed us to be more attentive and ask relevant follow-up questions.

The participants were asked for their permission to be recorded and were informed of how the recordings would be used. The interviews were conducted one-on-one through Microsoft Teams and Zoom.

From the mind map, we formulated 37 questions (appendix 2) which were then assigned to different sections of the interview which moved from open-ended questions to closed-ended. The method for the interviews were initially thought to be semi-structured but as we developed our questions, we realized that we could start with unstructured questions (open ended), move on to a semi-structured body of questions and towards the end ask quite direct questions (closed-ended) that we wanted the answers to.

While conducting the interviews we wanted to have unbiased answers and therefore decided not to interview people we knew well and try not to influence the participants. For example, if the interviewees were told that the research was focused on acoustics, they might think that sounds are a bigger issue to them than it is. Due to this they might not bring up issues regarding other things that we were interested in. To find participants we reached out to friends, family, and other contacts to hear if they had any colleagues or friends who had been working from home and were willing to participate. We wanted enough interviews to reach saturation.

In order to get more comfortable and see if our questions and structure worked, we conducted two pilot interviews. The pilots resulted in some changes to how questions were formulated but otherwise, they went according to plan. Our predicted interview time was 30 to 45 minutes and this was also confirmed in the pilots to be a good estimate.

Analysis
Once all the interviews were conducted we had four hours of recordings. In order to draw any conclusions we first had to analyze the recordings thoroughly. There are many ways and methods to do this and we wanted to maximize our understanding and build empathy. Since we had a limited sample it was also important to analyze their answers in relation to their living conditions.

We decided to use an iterative analysis approach where we would reflect on their answers in multiple steps. The process consisted of three different steps, the first was to view the video-recordings together and write down notable findings on post-it notes. In the second step, we grouped those post-its based on similarity and then drew relationship lines between groups based on cause, effect and similarity. In the final step we wrote down our findings based on the found relationships.

3.2.3 Results

Our primary findings are summarized in Table 1 below.

A majority of the interviewees wanted to keep working from home in the future, about two to three days a week. They felt more productive when working from home due to it being a calmer environment compared to their offices. This also meant that there were fewer disturbances at home which made people focus better.

The main point of having a separate room as a home office is to have all equipment in one place. This tended to be more of a problem for those working at their kitchen tables.

They complained that they were not that comfortable at home, most did not have a good office chair or a height adjustable desk. Sufficient lighting at their workspaces was also a common problem for the interviewees.

Table 1
Interview results

Equipment	*Productivity*	*Environment*	*Future*
• Workspaces are often poorly lit	• People took fewer breakes at home than at the office	• The interviewees felt a lack of social interactions	• They wanted to retain the ability to work from home
• Equipment provided by the employer can be scarce	• They perceived themselves as more effective at tasks requiring high degree of focus	• They did not want to sacrifice parts of their home for work	• The interviewees felt it easier to organize the life puzzle when working from home
• Video-conferences can feel like a breach of privacy	• The experienced noises were generated by others in the home	• They did not want to see their workplace during free time	
• Every interviewee had a dedicated[1] working space	• There are more distractions at the office than at home	• They felt like it was harder to let go of work after a day of working from home	
• They want to be able to choose in which room to work	• Most feel that they are more productive at home than at the office	• The home environment felt calmer than the office	
• The desk space and equipment requirements vary from person to person	• They tend to move and exercise less	• They do not want to feel claustrophobic when working	
	• Some had implemented routines in order to separate work and private life		

[1]Dedicated refers to a primary place to work at rather than changing every day

A majority of the interviewees perceived it hard to let go of work when the workday was over, in many cases they expressed additional stress from feeling the need to be available and answer emails also in the evenings.

"I have discussed with friends and colleagues, how can you trick yourself into going to work? More importantly, trick yourself into going home from work even though you are at home."
- One of the interviewees

Some did this by putting their laptop in a backpack and taking a walk before and after work as a way to *fake their commute*. Those who had a room dedicated for work, i.e. home office, did not experience these problems to the same extent since they could close the door which gave them a clear physical representation of when the workday was over. However, even those who had a home office expressed that they worked more hours and felt more responsible for getting work done.

Some of the interviewees were working at their kitchen table. One participant had a home office but sat instead at the kitchen table claiming that the environment was better there and that she liked being in the "heart of the home". Others did not want to sacrifice their home to their employer and therefore refused to get a desk since they considered it to disrupt the feeling of their home. They also thought that seeing their workspace when not working was a stress factor. When asked what changes would have been made to work from home full or part-time permanently, many said that they would rebuild their house or move to a bigger home.

3.2.4 Conclusions

Noise and focus did not seem to be problematic for the interviewees, not to the same extent as was first thought. The main issues when working from home seemed to be the physical workspace, the video-conference ordeal and the fading boundaries between work and personal life.

3.2.5 Discussion

Some of the findings were expected such as that people wanted to retain the ability to work from home some days. Athough the interviewees perceived that their productivity was high when working from home, the literature suggested that there would be an equal number of people experiencing decreased productivity.

Wanting to work in certain places at home but not wanting a permanent workspace was something we wanted to look further into when moving forward.

The lack of social interactions that normally occur in a workplace was perceived as a negative effect of the pandemic. Most questions made the participants reflect on their work-life during the pandemic since that was the current situation. We got answers that in some cases were specific to being forced to work full time from home. We do not think that social interaction will be as big of a problem in the future, most will work two to three days a week from home which would most likely reduce that problem. Since our project was about working conditions at home in a non-pandemic setting we decided to not focus on problems directly related to the pandemic.

We felt as though the interviews did not really give us all the information we wanted and to get a deeper understanding of how it really is to work from home we needed to find different ways to understand the users. We could not observe people for a whole work day, partly because it would take too much time and partly because it would change the behavior of someone that usually works from home alone and is knowingly being observed.

Due to our small sample of interviews we planned to increase the number in sprint 2 and interview younger people living in apartments since the majority of our interviewees were middle-aged and lived in individual houses.

3.3 Ideation

Sketching was used as a tool to not lose any ideas we got during the project.

3.3.2 Methodology

By quickly sketching the ideas that came to us spontaneously we could avoid losing potentially valuable ideas. Since both of us had an iPad with a stylus, the sketches were made as digital notes. Since we both already used our iPads for taking notes during the interviews they were always with us when working on this project. Ideas could be sparked by discussions or during reading.

3.3.3 Results

The sketches in Figure 2 are not solutions, they represent ideas that could be beneficial later in the project. These ideas could either be used as complete ideas or combined with other ideas as complementary solutions. Another reason for sketching was to communicate ideas better. By coming up with ideas and looking at problems from multiple perspectives we did not only generate concept ideas but also gained a deeper understanding of different situations.

3.3.4 Conclusions

There were no conclusions made based on the sketches at this point, sketching worked as note taking and we would return to these ideas later in the process to see if there was anything useful when we had a better understanding of which direction this project would take.

3.3.5 Discussion

Drawing an idea as soon as you come up with it in a discussion or when reading literature was quite stimulating and brought some color to the daily work of this project. It was a great way to unload your memory because once the idea was drawn, you did not have to remember it anymore, it was just archived. This archive was of great use in future discussions and workshops.

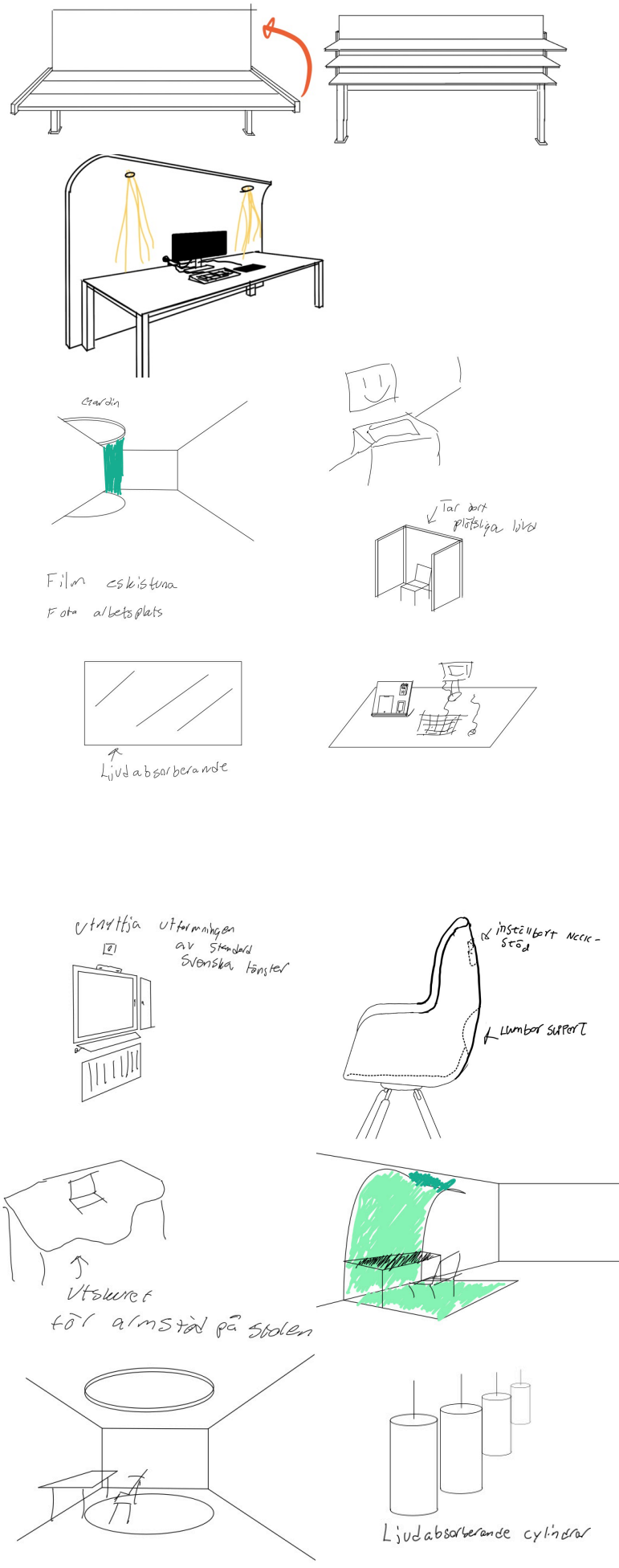


Figure 2
Initial sketches

3.4 Reflections on Sprint 1

In this sprint we got a bird's-eye view of the complex situation that is working from home, where many different factors collide, such as an individual's motivation, physical environment, employees' support, families and private life. By gathering our most important findings we hoped to be able use them moving forward. In particular, we would further investigate the ability to retain focus during a workday by minimizing unexpected distractions, how working from home affect stress while not working and what elements of a good office environment can be used at home.

We knew that people want to continue working from home and there does not seem to be any issue with decreased productivity for the employees.

Although a lot of information, insights and knowledge were garnered in Sprint 1, there were still plenty of questions to answer and even more questions to be asked. In Sprint 1 we got a good overview and more specific information about people's daily lives which were needed to draw conclusions. An interesting area that we missed in Sprint 1 was to interview people living in smaller apartments. However, we did not found any major problems with working from home, nothing that we could confidently investigate further.

We felt as though the responses from the interviews did not give us the depth we needed to generate ideas. Since we could not observe people for over eight hours a day and not have them be affected by being observed, we needed to find other ways of conducting deeper research. This is where we learned about generative methods and planned to make use if them in Sprint 2.

4. SPRINT 2

In this sprint, we traveled to Abstracta in Lammhult to learn more about and get inspired by Abstracta's products and production. Before our visit, we had prepared a Cultural probe. The probe is a package containing tasks and challenges that is sent to people to gain knowledge about people's life without observing them. We also hosted a workshop at Abstracta with the Product Development Manager and his team. The primary focus of the workshop was problem definition and optimal experiences when working from home.

4.1 Cultural probe

Everyday challenges need to be taken into account when designing for someone working from home, it can be small challenges such as having too many cables on a desk or work impeding in some way on your private life. Small details can have significant implications from a design perspective, and it is not always apparent that those small details and their implication will be revealed from interviews alone. We wanted to know about hidden behaviors, subconscious decisions and reasoning. Therefore we started searching for methods to accomplish this.

Cultural probes are a research technique for understanding users through self-documentation. Participants in cultural probe studies are provided with packages containing tasks and challenges to help them reflect on their daily experiences and document them. The tasks provided in the probe allow the participant to reflect in ways they otherwise would not have done (van Boijen, Daalhuizen, Zijlstra & van der Schoor, 2013).

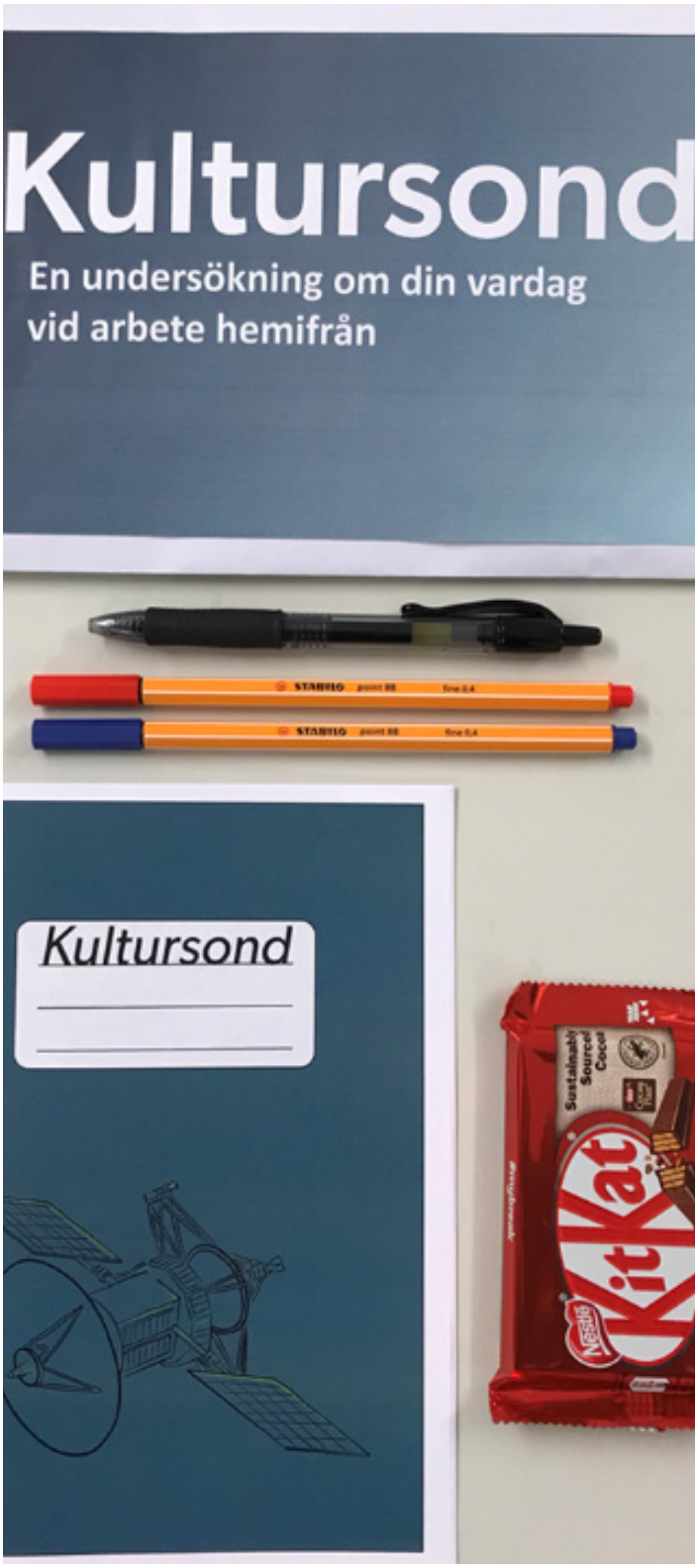
Cultural probes are a fitting research technique when there are difficulties in observing the users in the intended situation for the study (van Boijen et al., 2017). In our case, we could not observe people working from home. That would mean observing a person for 8 hours. Another downside of observing is that the behavior of the observed person would most likely change if they knew we were watching. The cultural probe was, in our opinion, the closest we could get to observing someone working from home.

In order to develop a cultural probe (Figure 3) that suited our specific research needs, we adopted a goal-oriented approach. Since there is no *one size fits all* template for a cultural probe, we started by identifying the goals we wanted to achieve through the probe, and then determined the tasks and elements that would best help us reach those goals.

4.1.1 Goals

Our goals for the probe were straightforward. We wanted to map behaviors, feelings, routines and find touchpoints where we could make an impact on the satisfaction for someone working from home.

Figure 3
Our cultural probe



4.1.2 Methodology

By breaking down the challenge of creating a cultural probe into manageable chunks, we considered tasks, provided materials, first impressions, how much of an effort the tasks should require and other factors that might affect the result. The tasks were decided through several creative sessions in which we discussed what we wanted to know, what would be fun for the participant in order to engage them and how specific tasks should be presented to minimize confusion and misinterpretations.

To avoid confusion and misinterpretations, we thought about what could go wrong and then tried to address those potential flaws. Since no one in the team had participated or created a cultural probe before, we got inspiration from other probes we could find on the internet. We found that they were often playful and invited the participants to think *outside the box*. How unconventional or creatively challenging a probe can be will mostly depend on the people taking part. If they are design students, it may be appropriate to create something challenging and outside the box. Our participants did not necessarily have a creative background, hence we deemed it more appropriate to start with simpler tasks and one by one make the tasks more challenging.

To come up with tasks we first needed to figure out what areas we wanted to know more about. Our primary areas of interest were routines, movement within the home, energy levels, dreams and ideal working conditions. We then ideated different tasks that would give us more insight into a specific area. By drawing a timeline of what a participant would go through during the probe, we decided that 20 minutes of probe-related tasks per day over the course of five days would be the upper limit of what participants would manage. This would also provide us with a lot of information to analyze.

We ran a small workshop where we ideated different tasks that the participants would complete in order to make them think about their own work-conditions at home. By the end of the ideation, we had many ideas of tasks and we eliminated certain tasks based on the risk for confusion and how much insight we thought the tasks would generate. The order of tasks was grouped based on similarity and also on increased difficulty since we anticipated that easier tasks would sensitize the participants to be able to perform more demanding tasks at later stages in the probe.

Who the participants were was an important factor for what type of tasks would be included. Therefore we started searching for willing participants. After trying to reach out in person, on Facebook, via emails and through phone calls without success, we realized that we overestimated people's willingness to participate. Our only breakthrough came from Abstracta. Since we had a workshop planned for the visit, our probe would also work as a sensitizing activity before the workshop. Therefore the tasks were decided based on our knowledge of who the workshop participants were.

Final probe-design

After many revisions and iterations, we had a final design of the cultural probe. It consisted of a pamphlet with tasks, specific questions and prompts to reflect. The probe was changed to be completed over the course of four days, preferably while working from home, but most tasks could also be completed at the office.

Each day's tasks were grouped according to themes and level of difficulty, although the difficulty was more of an abstract concept in our case. Although the tasks were straightforward, they necessitated participants to adopt a third-person perspective on themselves and their situation, which could pose a challenge.

In Figure 4 below is an example of one of these tasks, which involved drawing a layout of your home and then tracking your movements throughout the day.

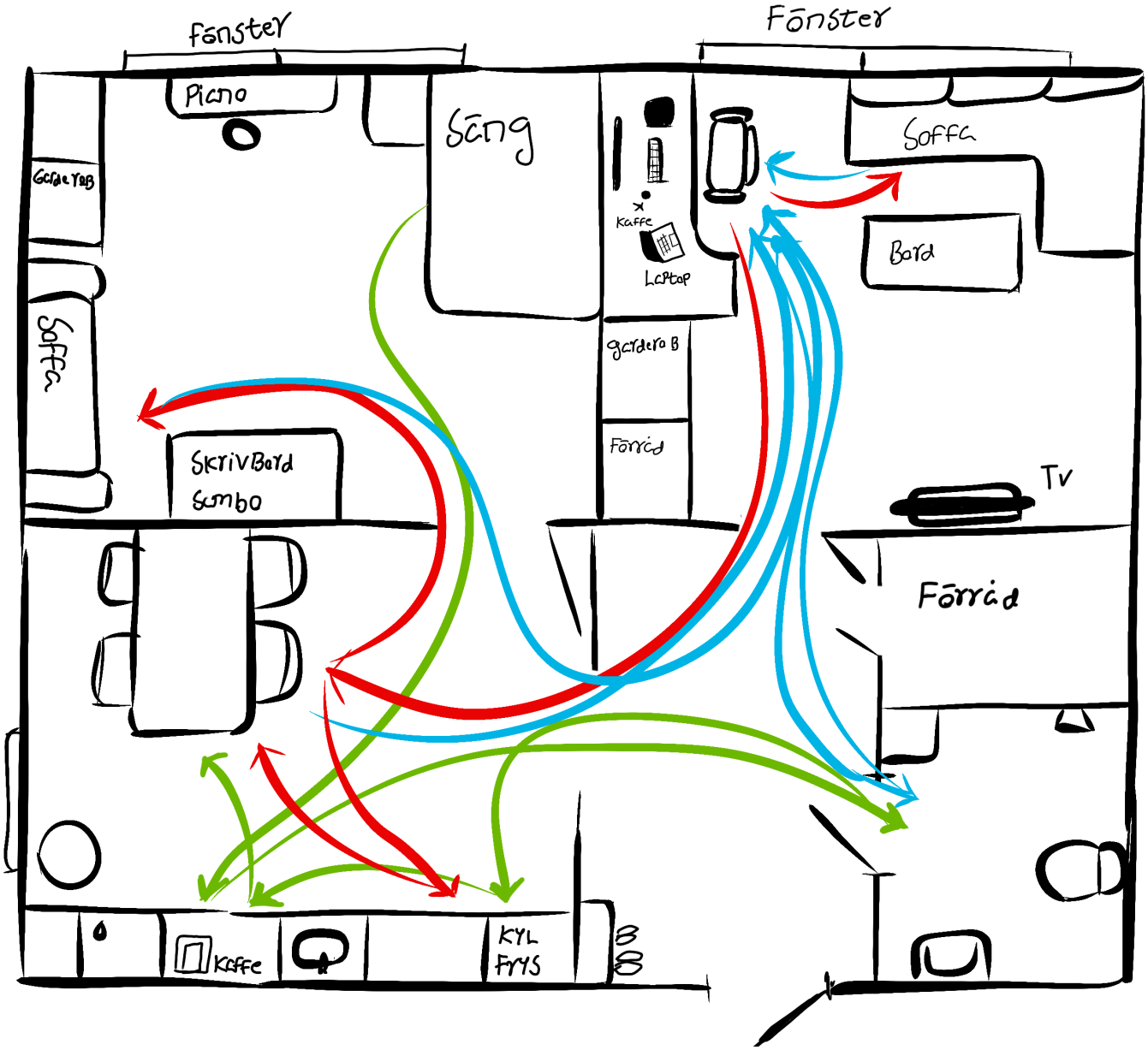
The themes for the days are:

1. Physical environment
2. Routines and mood
3. Equipment and positive and negative aspects working from home
4. Dreams and ambitions

The cultural probe can be found in its entirety in Appendix 3.

Figure 4

Probe task of movement at home



Analysis

We analyzed the probes by carefully reading them, searching for related information, comparing them with previous findings, and trying to understand them better. We read each probe multiple times and wrote down important insights to combine with our previous knowledge.

4.1.3 Findings

Unfortunately, due to miscommunications, the probes that were supposed to be completed over the course of four days were completed in one day, the last one, by all the participants. The effect of this was that the first half of the probe was done with visible care and consideration, while the latter tasks were done in a haste or not at all.

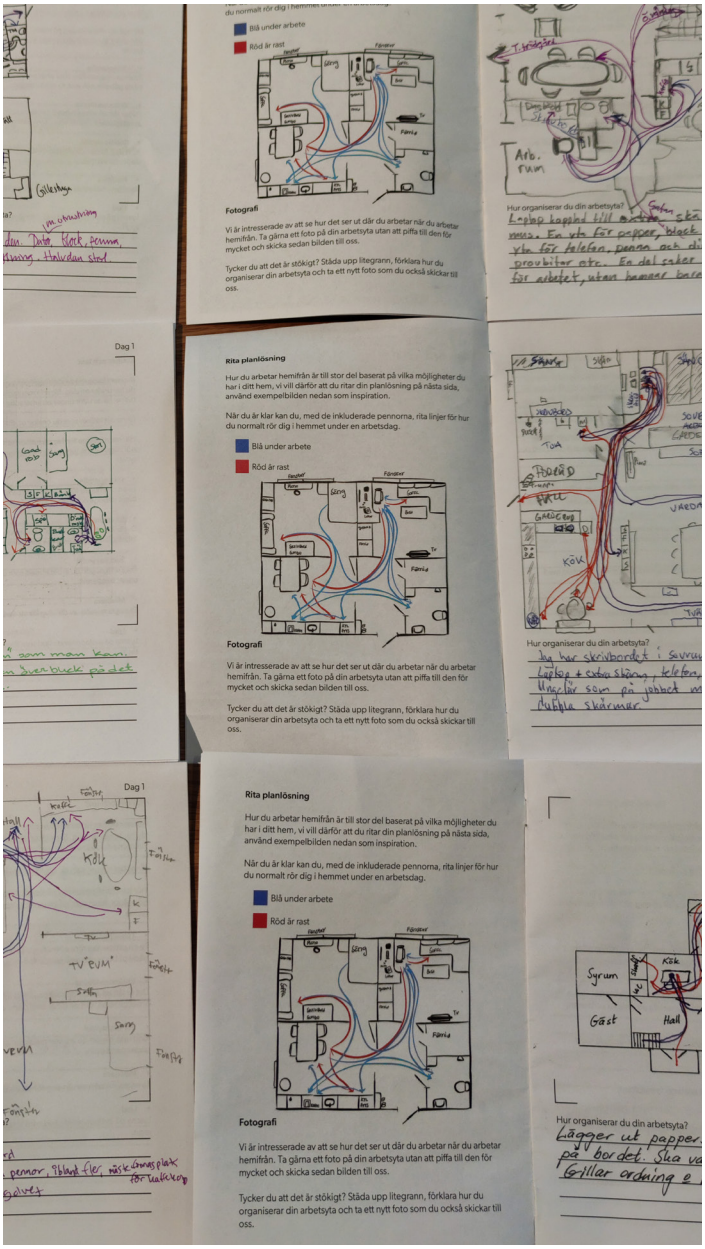
Therefore most of our findings were related to the first half of the pamphlet. We learned that the participants moved significantly more through their homes during a workday than anticipated. This was in contrast to answers from our interviews, and the participants were also surprised that they moved as much as they did.

Good routines seemed to be one of the most critical factors for satisfaction when working from home, and those who expressed that they liked their routines were generally also more satisfied with working from home. Most routines described were about organizing a workday, not only when working but also when starting the day and ending it.

Some described that they had a particular routine each morning that led up to them working and the habits helped them feel in control and productive. Perhaps more interesting were the routines surrounding the end of a workday. Those who had children usually picked them up from school marking the end of the day while others exercised. The common denominator was that some kind of action was required to be able to separate work from leisure. Those who did not have these routines described dissatisfaction with working from home.

When it came to the physical workspace at home most participants did not want to sacrifice parts of their home to enhance their work environment. Those who had sufficient space at home had dedicated rooms as home offices, but most did not have the ability or willingness to do so. Satisfaction with their workspaces was then low but it was better than disturbing the rest of the home. When asked what their ideal work environment at home would be like if they had no limitations, most answered that enjoying their home was more important than a good workspace.

Being messy while working was expressed as something positive by all participants. Those who worked at a kitchen table thought it was annoying to set up and remove their workspace daily and also have to tidy up their messy workspaces.



4.1.4 Discussion

Our most valuable insights were that routines were crucial in finding a good balance between work and free time. These routines were often based on an activity like picking up the kids from school, but those who had a separate room for work managed this by closing the door to that room. It seems that association is an important factor.

We interpreted the answers as if someone were to work in their living room, the association of that room after a workday would be that of a working environment, not a relaxing part of their home. It could also be the other way around, it could be difficult to retain focus in a room where the person is used to relaxing. We suspected that the activity-based routine somehow resets this association, making it easier to change how a room was perceived. Those who worked from their kitchen tables removed their workstations each day, which eliminated the visual cues that reminded them of work which may have solved the association problem.

For us this opened up many possible ideas. Could we make a workspace that provides better equipment and ergonomics than working with a laptop at a kitchen table? Or make a workspace that could somehow disappear when not in use to remove the visual cues that remind the user of work?

Another important insight was that most participants said that they did not want to sacrifice parts of their homes for work. The word "sacrifice" reveals their attitude towards having a traditional workstation at home. Sacrificing space for work is not just about physical space, but also about visual space. In the context of working from home, visual space is the ability to see one's workstation or work-related items when not actively working.

As for the probe itself, the time and effort put into the probe were perhaps not worth the insights we reached and other avenues could have resulted in more practical knowledge. However, since this project was more about learning and the journey than the result, this was not a major issue. We learned a lot from designing the probe and about engaging a user in a task while not being present. In workshops there is always the option to nudge the participant continually in the right direction. This is not a luxury you have when sending out probes.

The probe took us just about a week to create and it was a stressful but fun exercise, it is always joyful when you get to implement the design process in ways you never thought of before. In our case we had to empathize with the participants in order to create the probe without having conducted one ourselves. By discussions within the team and also with our academic supervisor, we managed to avoid pitfalls that could have made the probe a waste of time or lowered the quality of the answers.

The probe was completed prior to the workshop with the same participants, therefore it served as a sensitizing exercise as well as a way for us to learn more about working from home.

4.2 Workshop

A workshop could be considered a long, interactive meeting or session to achieve a specific goal. The participants in a workshop could be randomly selected or consist of a handpicked list depending on the context of the workshop and its goal (Wikberg Nilsson et al., 2015). The goal of workshops is to utilize the creativity and knowledge of the group to solve tasks and challenges designed by the facilitator.

4.2.1 Goals

The workshop at Abstracta had a specific goal, to gain deeper knowledge into what challenges people working from home face. The participants were six employees at Abstracta with different areas of expertise, from ISO certifications to product development. We wanted to utilize the participants' knowledge as professionals in their respective fields and as people who had worked from home for the last two years.

4.2.2 Methodology

Designing the workshop
When designing a workshop, there are different things to consider, such as content, time management, group dynamics, information, how to engage participants and more. Because we sent out cultural probes as a sensitizing exercise beforehand, we wanted to build on that.

In order to build and prepare the workshop, we started with setting goals for what we wanted to achieve. Our goal with the workshop was to define problems and their contexts to be able to ideate in the following sprints.

We decided that problem solving and ideation were appropriate tools. By trying to solve a problem, we hoped that the participants would try to view the problem in a creative way, i.e., not only looking at the problem but also why it exists in the first place and what the consequences are of trying to solve it in a certain manner. However, before any ideation could take place, the participants would need to be warmed up and up to date on the challenges other people face while working from home to expand their perspective.

After a lot of discussion within the team, we decided on a workshop schedule that consisted of three parts, spanning 50 minutes each with breaks in between. The first part was related to the probe. We asked participants to, in groups, discuss five questions relating to their own experiences of working from home. Once the questions had been discussed, we had a conversation with all the participants so each group could inform the other and us on their thoughts. This was done to inspire one another and emphasize that sharing and thinking freely were encouraged.

The second part was problem definition. The goal was to identify and specify problems that different demographics or specific people could experience. Each participant did an individual brainstorm on what kind of problems the target group experienced and then presented to the group what they came up with. The group would then examine a few of the problems selected based on importance and frequency. The problem analysis consisted of looking at the problem from the perspectives of who experiences it, who does not, what is the cause of the problem and what consequences the problem results in, see Figure 4. This approach was inspired by the Five Whys method and provided a good foundation for deeper understanding.

The third and final part was ideation. From the problem definition, each group got to ideate solutions to two of the problems that they analyzed. We, as facilitators, listened to the discussions when the participants ideated and noted what they worked on and why.

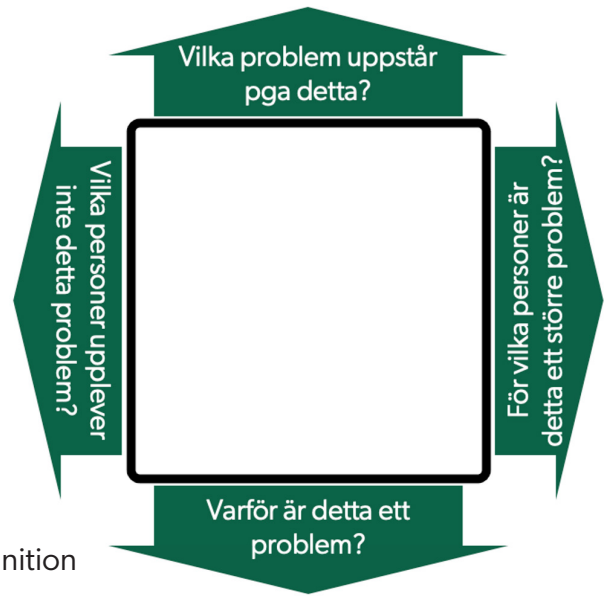


Figure 5
Problem definition


DIG SJÄLV
BOR LITET

Analysis
To gain more context for the participants' situations, we analyzed the workshop material along with the probe results. This involved going through the material and discussing implications and meanings, as well as connecting the results to findings from previous interviews.

We divided our findings into two categories: needs and context. Needs refer to an individual's requirements for satisfaction, while context refers to the situations people experience. To draw conclusions, we had to find connections between these two categories. For instance, if people need to work without distractions, we needed to understand in what context they were getting disturbed, such as having kids or pets at home.

4.2.3 Results

In the workshop, some of the things we observed were that they liked working from home but missed social interactions, they disliked noise generated from others within the home and that their workspaces were poorly lit. The results were almost identical to our interview findings, which was positive in that it reinforced our existing knowledge. However, it was also somewhat disappointing as we had hoped to uncover new insights. These findings can be found in table 1.

Based on our findings, we formulated design requirements. Our solution must be flexible, well-equipped, and non-disruptive to the home when not in use. These requirements were the culmination of multiple insights gained throughout the process so far. We chose flexibility as a requirement because most people do not have a stationary workspace or do not want one that takes up too much space. To us, flexibility means something that can be moved, hidden, or used in multiple areas, offering users the freedom to customize their working environment at home without disrupting their daily lives. This also ties into our aim to create a workspace that minimizes the impact that working from home has on one's ability to relax and not be reminded of work when not working.

In terms of being well-equipped, we wanted a solution that provided the same working conditions and ergonomics at home as an office would. For instance, providing the ability to have an external monitor would improve the tilt of the head from a forward position to a more neutral one.

4.2.4 Discussion

During our education, we have hosted multiple workshops but almost exclusively with other students. Hosting and creating one with participants not used to the creative type of workshop forced us to reconsider many aspects that we had previously taken for granted.
David Kelly (Walters, 2013) talks about creative confidence which was a big inspiration for us and made us think about what we could expect and how we should structure a workshop to encourage thinking way outside of the box. By starting off with relatively simple and familiar tasks that we expected the participants had previously encountered, we created a baseline for a comfortable environment. A big part of us trying to inspire creative confidence was to interact with the participants as facilitators during the workshop. We asked follow up questions when a discussion died down and tried to encourage them.

By starting soft we also wanted to create a baseline of knowledge to build on for the participants, not only telling them what we knew but pointing them in a direction and letting them find the answers themselves. This can, from a certain perspective, be considered a waste of valuable time, but we would instead frame it as a way for us to know what participants thought untainted by our bias and preconceptions. Similar to our approach in the interviews with users, we aimed to avoid influencing the participants' answers in a way that would align with our own preconceptions or biases.

As facilitators we were careful not to say things like "many that we have spoken to have expressed this", as not to spoil the validity of their discussions. There is a thin line between not wanting to influence but also wanting to discourage irrelevant problems that will not improve the workshop.

4.3 Complementary interviews

We realized we had missed some demographics in the initial interviews, mainly people younger than 30, but also employers. For the younger demographics we used the same questions as in previous interviews.

4.3.1 Younger generations

Since we had reached saturation in the previous round of interviews we set out to conduct only a few more interviews. If the answers we received differed a lot from the previous ones, more interviews would have to be conducted. Three interviews were initially conducted.

Based on the interviews we conducted, we discovered that people between the ages of 24 and 30 and who live in big cities encounter mostly the same problems as we had previously identified. The only exception we found were those who were avid computer gamers. It appears that utilizing a workspace for things other than work makes it easier to rationalize having a large desk in an otherwise small apartment. Interestingly, their desk was not seen as an interruption in the household, as we had heard in previous interviews. Instead, it was viewed as a natural part of the home and was highly appreciated. This sentiment echoes the expressions of older generations who also believed that if it is used for purposes other than work, it is less disruptive to the home. The key takeaway from this finding is that a desk with multiple uses would be less bothersome in a home.

4.3.2 HR interview

We also interviewed the head of Human Resources in a Swedish government agency. For this interview we had prepared new questions regarding the agency's view on their employees working from home. The central theme of the interview was future work dynamics, what responsibilities the employer has in this new situation regarding the work environment, what problems that the employees had expressed to HR and what the labor unions were currently pushing for in regard to working from home.

Based on the management perspective, we gathered that working from home is not an inherent right but rather a privilege that an employer may offer an employee, provided that the circumstances are suitable and it does not impede the employee's work performance. As such, it is not the employer's obligation to provide a suitable working environment when working remotely. If an employee is unable to create a satisfactory work environment at home, they should opt to work at the office.

If a new norm develops that makes hybrid work more common, resulting in a reduced demand for office spaces to be rented, then it may become necessary to consider providing support to improve the working environment at home. However, the HR representative mentioned that it is uncertain which direction the trend will take in the future.

4.4 Reflections on Sprint 2

In this sprint, we gained a lot of knowledge and became better at empathizing with the situation of those who worked from home. The key to this sprint was perhaps not to learn things that we had completely missed in Sprint 1, but to *connect the dots* and establish design requirements. By learning how people lived, worked, their routines, relationships to others, their goals and ambitions we definitely gained deeper knowledge, which was the main goal of this sprint.

Sprint 2 represented the last sprint focused on information gathering. Applying this information was a massive undertaking that we expected to be challenging. Moving forward, incorporating this information into ideation would always be a challenge.

In Sprint 3, the intention was to focus on ideation but also on user experience and how we could improve the experience of working from home through good design and understanding.

5. SPRINT 3

In this sprint we looked at how user experience can be applied to our project, how we can apply the principles to our process of ideation and concept development and then moved on to prototyping and user testing.

5.1 Literature review 2

In the first literature review the aim was to investigate the current circumstances under which people are working from home. In the second literature review, we felt the need to instead investigate some terminology we had come across. We wanted to create a product that is pleasurable to interact with and with a focus on the user experience when using a product, we wanted to read up on UX design.

Ergonomics was something that was frequently mentioned by people we have talked to about working from home, but what do they actually mean? What is ergonomics – really?

5.1.1 Research questions

- What is UX design?
- What is ergonomics?

5.1.2 Methodology

We searched for books in the library at Luleå University of Technology regarding User experience (UX). A majority of the findings was strictly related to human-computer-interaction and how to use UX in digital products such as websites. The books that were not specifically about digital products were read. By recommendation we studied P. Jordan's *Designing pleasurable products* (2000).

Regarding ergonomics, with a quick search on Google we found articles referencing to the International Ergonomics Association (IEA) and read their definition of ergonomics.

5.1.3 Results

UX design

"If you have built castles in the air, your work need not be lost; that is where they should be. Now put foundations under them".
- Henry David Thoreau (n.d., referenced in Faranello, 2016)

The ISO (2010) definition of user experience (UX) is "(a) person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service".

UX includes all of the users' emotions, beliefs, preferences, perceptions, behaviors, accomplishments, physical responses and psychological responses. This is a result from brand image, presentation, functionality, performance, behavior and assistance of said product, system or service. The experiences do not only apply to those during use but also those before and after use and can differ between users due to the experiences being influenced by users' prior experiences, attitudes, skills, personality and context of use (ISO, 2010).

Faranello describes good UX design as more than just look, feel and the most effective place on the screen to put a submit button. Good UX, he writes, is about the mindset, creativity and recognizing that the value of UX lies in how we think and how we approach our work.

He writes further that feedback should not be taken so literally, engaging with users is a balance. He means that it requires a UX mindset in order to see what the users are telling us and this understanding requires engagement informed by experience, expertise, psychology and design.

"If you are in a shipwreck and all the boats are gone, a piano top buoyant enough to keep you afloat that comes along makes a fortuitous life preserver. But this is not to say that the best way to design a life preserver is in the form of a piano top. I think that we are clinging to a great many piano tops in accepting yesterday's fortuitous contriving's as constituting the only means for solving a given problem".
- R. Buckminster Fuller (n.d., as referenced in Faranello, 2016)

Faranello also explains how the user should never notice an interaction or have to think about it; products should just work and do what the user expects without causing distraction. To ignore the users and miss the not so obvious issues resulting in failure will not be their fault, but ours as designers (Faranello, 2016).

Interactions between a human and a product can be called user experience touch points, according to Rosenzweig (2015), who means that these points are vital to the experience of a product or service. She writes that it is common to remove unnecessary interactions with good design or technology advancements. Unusable mechanisms can hurt us physically and emotionally. Unnecessary or redundant actions that do not contribute toward reaching a goal should therefore be eliminated through development. It is essential to design things that contribute to both personal experiences and social experiences (Rosenzweig, 2015).

The four pleasures

Jordan (2000) describes four product pleasures; physio-, socio-, psycho- and ideo-pleasure.

Physio-pleasure is related to the body and sensory inputs, such as touch, hearing and tactile impressions, designs that appeal to our five senses.

Socio-pleasures involve the enjoyment of others, it is about different relationships such as the relationship to others or one's relationship to society. A product can invite social interaction by being enjoyed together with others, work as a conversation piece or be part of one's identity (ibid.).

Psycho-pleasure covers the areas of cognitive and emotional responses. In relation to products, this would mean that a product that is easy to use would be more satisfying than something more difficult to use. A sense of achievement or reaching a goal would fulfill this pleasure.

Ideo-pleasure refers to people's values and how a product relates to them, for example ecologically sustainable products. It can also be about the experience of aesthetics and how some products can be seen as pieces of art (Jordan, 2000).

Ergonomics

In 2000 the International Ergonomics Association (IEA) defined the term ergonomics as:

"The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and methods to design in order to optimize human well-being and overall system performance".

The word ergonomics refers to the science of work with the term human factors being a synonym. According to IEA (n.d.), ergonomics is a practice that can be divided into three disciplines, physical, cognitive and organizational ergonomics.

Physical ergonomics is the discipline concerned with the human body and physical activity, more specifically things like working postures, repetitive movements, physical safety and health (IEA, n.d.).

Cognitive ergonomics is about the human mind and mental processes, such as mental workload, decision making, human-computer interaction and work stress (IEA, n.d.).

Lastly there is organizational ergonomics concerned with organizational structures such as communication, teamwork, and telework (IEA, n.d.).

The practice of ergonomics, as described by IEA, is about taking a holistic perspective of products and systems and the relationship between human, technical and environmental components. It aims to provide safe and sustainable systems.

5.1.4 Discussion

The quote from Henry David Thoreau "If you have built castles in the air, your work need not be lost; that is where they should be. Now put foundations under them" (n.d., as referenced in Faranello, 2016) explains a phenomenon quite well. We wanted to first figure out what this castle in the air is and then find a way to reach that castle and through which medium. Preferably the medium in which to achieve this castle in the air is some sort of physical artifact with acoustic properties to align with Abstracta´s other products.

UX as explained by Rosenzweig is about the design of interactions and the design of which interactions there should be. The castle in the air of many systems might be to remove most interactions, however some interactions will probably be needed to achieve an outcome. However, as Faranello wrote, designers should minimize the risk for failures and by eliminating the number of interactions, the risks of failure should decrease. This is also dependent on the design of the remaining interactions.

The quote by Buckminster Fuller explains the difficulties of this project; what solutions do we have today and are happy about only because no one has created a better solution yet? What *piano tops* are there for people working from home today?

Jordan's description of pleasures seems like a different description of user experience, especially psycho-pleasure concerned with cognitive and emotional responses. This seemingly goes hand in hand with usability since he claims that products that are easier to use are more pleasurable. Our understanding is therefore that to design for the four pleasures requires knowledge of UX and usability.

Ergonomics is a term we heard a lot in the interviews, and how people want to have more "ergonomic" work equipment in their homes. Our understanding is that they usually referred to comfortable and height-adjustable tables and chairs. As we understood it, our purpose was to improve human well-being in any way we could and since ergonomic chairs and height adjustable tables already exist, what could we further do to increase human well-being? Maybe the ergonomic chairs and height adjustable tables are the *piano tops* of today's WFH environments?

5.2 Personas

In order to summarize our research data and further develop empathy, personas seemed like an excellent way to define our target groups.

Stickdorn, Hormess and Lawrence (2018) write that personas are profiles that represent a target group. This profile should not be a stereotype, but an archetype based on research. Needs of multiple target groups can be merged within one persona and represent groups with similar needs or behaviors (ibid.). Personas can be used to engage and generate empathy for the team members but also limit the project scope. They can furthermore be used to align members in a project team, understand people's needs and review their tasks.

5.2.1 Research questions

The questions that had to be adressed were:

- Who are we designing for?
- What makes them users in our context?
- What differs between user groups?
- What are similarities?

5.2.2 Methodology

According to Stickdorn et al. (2018) there are seven steps to the development of a successful persona:

- A well-chosen portrait image can give authenticity to the persona and circumvent stereotypes.
- The name of the persona can reflect heritage and social environment.
- Demographic information gives context to a persona. However, this information can be misleading when predicting tastes or behaviors.
- A quote to summarize the information in the persona helps to build empathy.
- Mood images can enrich the personas' context. They can visualize environments, activities, goals and motivations.
- Add a description of personality, characteristics, interests, skills, needs, expectations, frustrations and background. The information in the descriptions should aim to be valuable towards the research questions at hand.
- Lastly, some statistics from the research gives the persona quantitative reliability. It can be used to back up qualitative descriptions.

We followed most of these steps but instead of statistics we chose to implement a type of empathy map. The empathy map consists of four areas; pains, goals, insights and behavior. We did not use mood images, instead we discussed what an ordinary day for these personas would look like as they were created to generate some context. Some of the attributes of the personas were based on our knowledge from the people we had interviewed and some attributes were made up based on our knowledge of how people live and work in Sweden. The attributes were needed to fill in the gaps in our storyline of an ordinary day. Through discussions they became plausible and helped us create situations that can create problems for us to solve.

5.2.3 Results

The descriptions of the two persona are found below.

Maria
Photograph by @neringa
from unsplash.com

Stefan
Photograph by @linkedinsalesnavigator
from unsplash.com

5.3 Journey map

A journey map as described by Stickdorn et al. (2018) aims to map out the experience of a user or customer. It can be used to visualize the chronological order of a situation, and/or use of a product or service. Further, a journey map can have different zoom-in levels depending on what is being investigated. It can be an end-to-end map visualizing the overall experience with a service, product or company or it can be zoomed in on a specific interaction. Stickdorn et al. mean that a journey map can also describe past experiences with current products or be a future map showing a desired experience, sequence of steps or activities. It can help in finding gaps in user experiences and find potential solutions. It can also make the abstract combination of experiences more visible and understandable to a project team.

A journey map has one main character according to Stickdorn et al. (2018), preferably one of the personas the team has developed but journey maps can also have multiple characters to show what is similar and what differs between the characters. The mapped experiences are divided into stages of the process, each stage with its respective activities or interactions. Through pointing these out, unnecessary interactions in the user's use process can be removed from the experience. An emotional journey represents the main character's satisfaction at every step of interaction on a scale ranging from -2 to +2.

5.3.1 Methodology

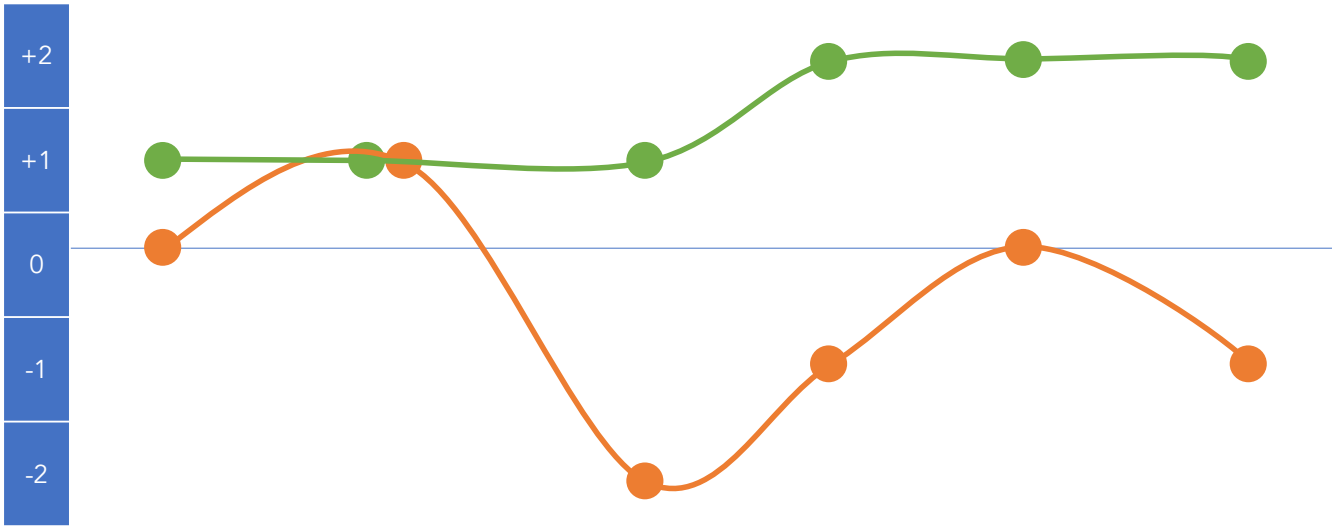
The journey maps started by discussing about how a day would look like for our persona Stefan during one day of WFH. Two axis were drawn on a whiteboard; one visualizing a timeline and the other the scale from -2 to +2. The assumed relevant activities during the day were written down chronologically along the timeline. The activities were then evaluated and ranked in terms of four different aspects; focus, energy, mood and satisfaction. Multiple journey maps were created with different zoom-in levels such as one week with work from home and at the office, two consecutive days and an afternoon. Journey maps for Maria was also discussed and created in the same manner. Finally, future journey maps were created to envision what an optimal situation would be.

5.3.2 Results

The journey map in Table 2 depicts a current scenario compared to a future one based on gained insights from users. The y-axis represents perceived satisfaction on a scale from -2 to +2 and the x-axis describes time.

Table 2
Current and future journey map for Maria

Now	Sit down at computer	Reading documents	Being disturbed by partner	Video-call	End of workday	Being reminded of work
Future	Choose location	Reading documents	Not being disturbed by partner	Change location for video-call	Close workspace	Use the space for something else
Attribute	Moveable	Expandable	Shielding sounds	Moveable	Compressible	Hideable



5.3.3 Discussion

We had a hard time deciding what would be relevant activities to include in the journey maps of the present situation and desired future, and finding something new and innovative to contribute to this desired future. What we gained was a better understanding of what a day of working from home might be like and how it could be improved overall.

5.4 Opportunity definition

The next method, problem definition as described by Van Boijen, Daalhuizen, Zijlstra and van der Schoor (2013), can also be called opportunity definition to create a more positive approach.

There is usually a tension between the current situation and the desired situation. By discussing these differences in the project they can be considered (ibid.).

The purpose of the opportunity definition was to get some clarity and be able to focus on the more important areas of the project.

5.4.1 Methodology

Answering these questions will describe opportunities and areas for which to generate ideas according to van Boijen et al. (2013):

- What is the problem?
- Who has the problem?
- What are the goals?
- What is the context?
- What are the side effects to be avoided?

To find what problems to analyze by means of these questions, a hierarchy of problems was created to find out what the sources and effects are to known problems (ibid.). This is to minimize the risk of merely defining an effect of a deeper problem.

5.4.2 Results

The results are summarized in Table 3.

Table 3
Opportunity definition

What is the problem?	Too quiet at home	The workspace negatively affects the home	Annoying sounds generated by others at home	Transport necessary equipment from work to home
Who has the problem?	-People living spaciously -People who hear small unwanted sounds -People who experience negative effects of reverb sounds	-People living in small spaces -Non-gamers -People who put effort into their furnishing	-People living with others -When multiple people are working from home simultaneously -People in conference-calls	-People that only has one set of their equipment -People that does not have a battle station -People who have the ability to work at multiple locations
What are the goals?	-Masking small unwanted sounds or masking the lack of sound -Making it more individual -Easier to use	-Hide workspace -Move workspace -Compress workspace -Make the workspace multi-purpose -Modifiable solution	-Decrease the experienced loudness of speech-frequency-sounds -Combine it with other things -Not creating something that already exists	-Improve portability -Make it easy to keep- and make it clean
What is the context?	-Home alone -Not having any sources of sounds nearby -Computer fan -People can turn on their radio	-Access to otherwise unused spaces -Equipment-needs -If multiple people are working from home	-Doors -Distance -Wall thickness -Two meetings simultaneously	-Ungenerous employer -Vehicle -What equipment is necessary
What are the side effects to be avoided?	-Sound can leak into conference calls -It will not be used -Hard to sell -Masking sounds might cause unpleasant reverb sounds -Difficult to integrate power outlets	-Do not solve a small-space-issue with a big product -Provocative design	-Making a too quiet environment -Creating new problems -Limit flexibility -Affect the style of the home	-Create a solution that is cheaper than the equipment -Make it hard to move short distances

5.4.3 Discussion

Through this opportunity definition we used the knowledge that we have gathered thus far in the project and our own experiences of studying at home.

The problem of a home being too quiet seemed difficult for us to solve and did not feel like a good fit to the project brief. This problem could be solved with earphones, as could the problem of annoying sounds generated by others, although the issue of annoying sounds might require active noise cancellation technology in the headphones.

On the other hand, that the workspace negatively affects the home seemed to have a lot of viable opportunities for us. The people who experienced this problem was a diverse target group and the goals required innovative thinking to be reached.

From our research with participants we understood that it is common to only have one set of work equipment. Since we were aiming towards people working from home part-time, the transportation of equipment is almost unavoidable.

From this opportunity definition we further strengthened the foundation of what user needs a solution should address. The main opportunities we continued with were that the workspace affect the home negatively and the transportation of work equipment.

5.5 Ideation

In an article in Harvard Business Review, Steve Blank describes what makes a start-up successful. Start-ups have a series of good guesses or hypotheses as to what they could bring to the market (Blank, 2013). Start-ups start off with looking for business models, how they can create value for themselves and for their customers. However, whether these will generate success has to be tested; successful start-ups fail several times before finding the right approach. Failure can mean to prove a hypothesis wrong but then learn from this and try another hypothesis. Learning from customers in order to improve hypotheses can quickly launch products that customers actually want (Blank, 2013).

We were not designing for ourselves, but for the Marias and Stefans of the world and therefore we had to talk to them about our ideas. We did not know in which direction we should take the project from this point, therefore we used the opportunity definition as a guide. We also leaned on what we knew from our research and what we thought could be viable concepts or value proposals.

5.5.1 Methodology

Our ideation process was based on investigating areas in series and trying to combine ideas whenever possible to expand our view and avoid settling for one decent idea. In this early ideation space we were looking for wild ideas rather than realistic ideas with focus on creating pleasure for the users.

The key areas that we ideated around came from the opportunity definition and were;

- Home being too quiet
- The workspace being obtrusive
- Sounds generated by others
- Transport necessary equipment from work to home

Each area was investigated and ideated individually through brainstorming sessions, discussions and combining techniques.

Once a sufficient amount of ideas had been generated we categorized these ideas into four categories; realistic, delightful, daring and longshot. By doing this and discussing aspects of the ideas we combined features and intent of ideas into a few concepts. These concepts were then discussed with potential users to gauge what they liked and disliked about the concepts.

In the first round of ideation we wanted to know what the minimum requirements would be for something to be considered *a good workplace*. Our first question was if a workspace needs to be a surface, or even have a surface. If we could remove or minimize the desk surface it would enable easier transport. This could also enable more flexibility in terms of where people could work, not introducing a new piece of furniture in people's homes and being able to hide and store their workspace in convenient places. Maybe furniture that is already available in the home could be complemented to create a workspace?

The concepts were shown to four of the persons we had interviewed in Sprint 1. We presented them with illustrations and explanations of our ideas through video calls. We wanted to understand what they liked and disliked about our ideas.

5.5.2 Results

The work resulted in five concepts:

Yoga mat
The yoga mat is meant to be flexible so that the user can mold it to their needs, soft when being adjusted and stiff when in use. It would allow people to work in a sofa or bed. It could also be placed on a table top to increase its height. This idea stems from creating increased flexibility in working positions but also for transportation. As seen in Figure 6, the yoga mat could work as a desk adjusted to a sofa instead of a normal desk.

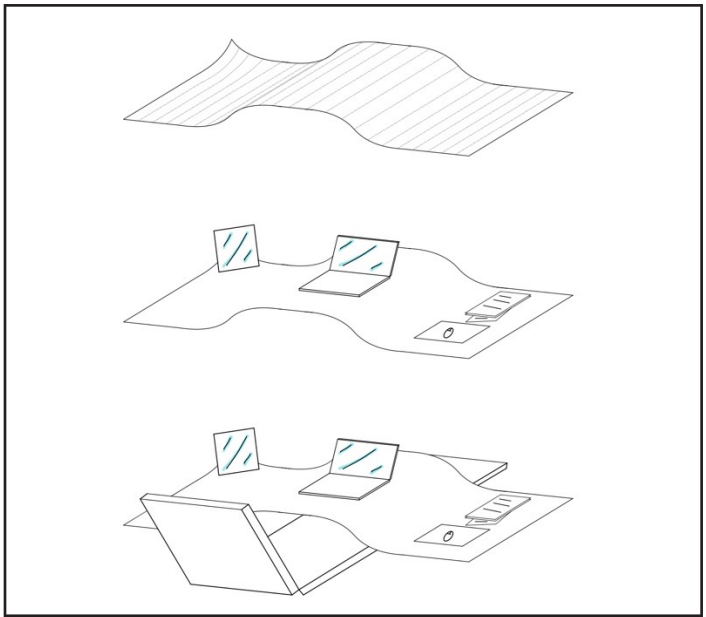


Figure 6 Yoga mat

Modular arms
Instead of a tabletop, everything you need could be mounted on a stand, even a small desk surface if needed. The idea is that all equipment can be *floating* in the air at a desired height for each item. With this concept you could work comfortably in any position from standing to laying on the sofa as in Figure 7. Since this concept does not have a large surface it could be folded together for transport.

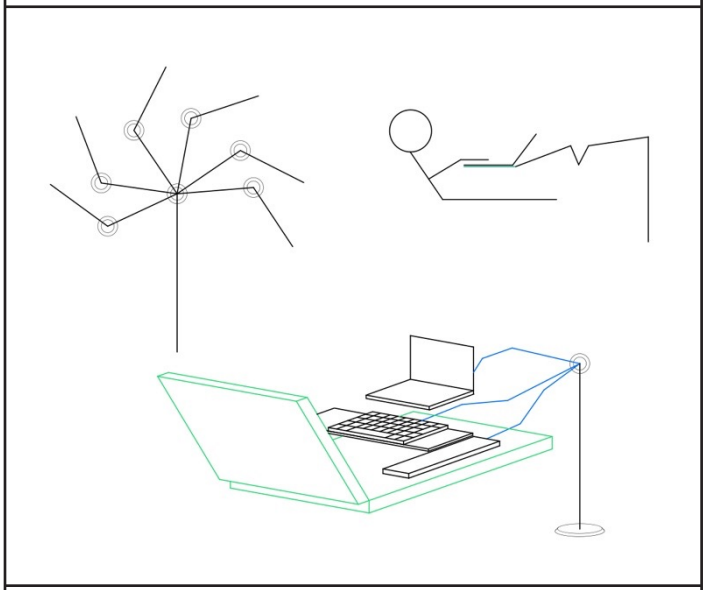


Figure 7 Modular arms

The Chairstation
The *Yoga mat* and *Modular arms* are concepts that challenge the idea that users want or need a desk surface. Because of this, the ideas make use of users' current furniture at home for sitting down. The Chairstation however is an adjustable office chair with an integrated desk surface and monitor stand that can be seen in Figure 8. The idea comes from professional drivers such as truckers that sit comfortably with their controls within reach.

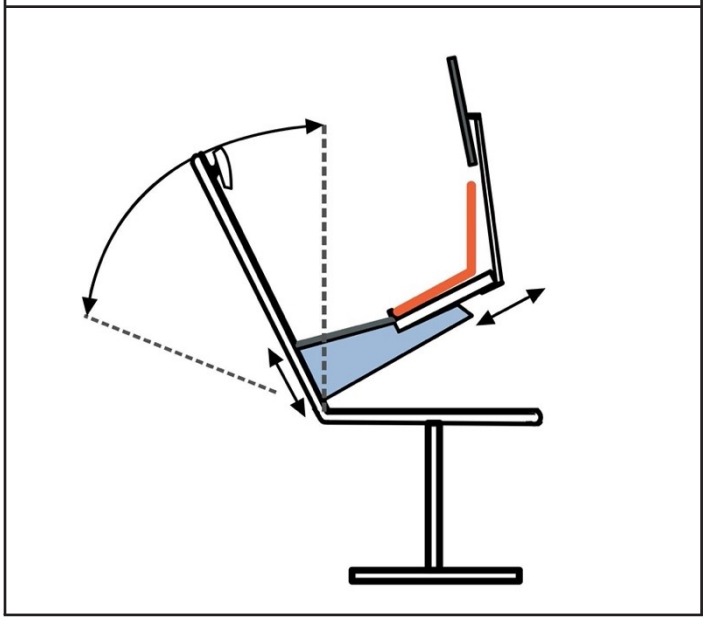


Figure 8 The Chairstation

White board
This concept aims to save space by being placed vertically against a wall. When needed it can fold out to create a desk surface to put a laptop or keyboard on, as in Figure 9. The surface is a whiteboard that can be used for note-taking. An external monitor is integrated into it. It is mounted to a stand instead of directly to the wall so it can be height adjustable. The stand is mounted to the floor and ceiling.

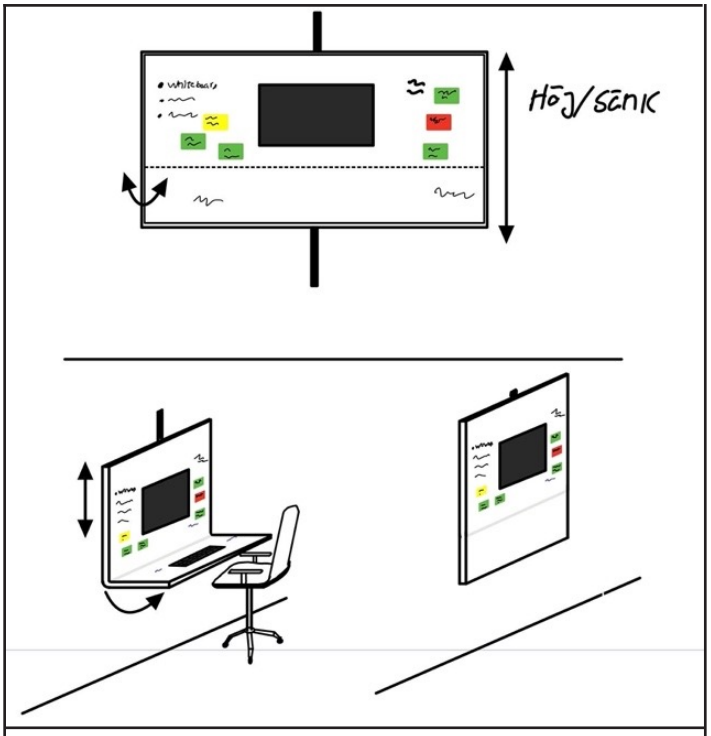


Figure 9 White board

Secretaire
By dividing a desk surface in two parts it can offer more than just a static surface. It can, for example, cover the workspace when not in use. It can also enable both a sitting and standing position without the need for electricity to adjust height, see figure 10.

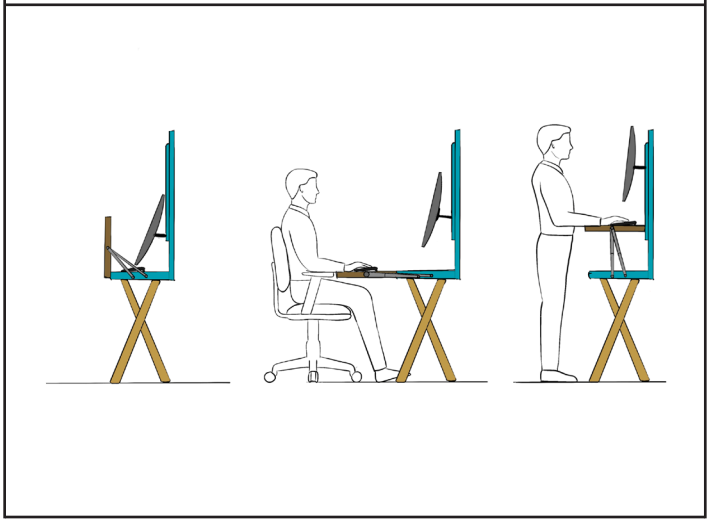


Figure 10 Secretaire

In summary, the *Yoga mat* was well received, the idea of having something that can be adapted really resonated with the users.

The *Modular arm* concept was intriguing to many but it was hard for them to imagine what it would look like in real life.

The Chairstation was disliked by all users, it would most likely feel claustrophobic and that it did not add anything new that was valuable.

The *White board* concept was the idea that got the most attention but not for the reason we hoped for. Most users said that they would like something like this in the office rather than at home.

Finally, many liked the idea of being able to hide their work within the *Secretaire*.

5.6 Further ideation

5.6.1 Methodology

When ideating on the environment being too quiet, it was hard to come up with solutions that brought more to the table than someone using a speaker or headset with music, radio or white noise. We investigated sound masking as an alternative but it seemed as a complex technique that needed to be adjusted to every unique environment. We kept the option to integrate sound into other concepts and moved on to the next key area.

Being exposed to disturbing sounds from others in the home was the next area and we wanted something that could make a real impact. Damping sounds is difficult and after a few wild ideas we decided that sound dampening should be integrated in whatever concept we decided to move forward with. It should not be the main function of the concept since we understood that there are more important needs than reducing noise at home. Many ideas were generated and one concept, specifically aimed at decreasing the impact of sound, was created.

Transporting necessary equipment from work to home was a wildcard for us. In the interviews we had heard, many times, that the employers only provided one set of work equipment (computer, monitor, keyboard, etc.) to their employees. We therefore wanted to see if we could create a concept that would make it easy to transport this equipment. The concept that we came up with was the Suitcase.

The last area that we ideated on was the workspace negatively affecting the home. Here we asked questions like can you store a workstation in a smaller format than when used? Can the workspace be something else when not used for work and can it somehow be hidden in plain sight? We deliberately ideated this area last since many of our previous ideas could be used in concepts trying to solve this problem. This ideation resulted in two concepts, a foldable table and Secretaire 2.

From these four idea generating sessions we had four new concepts that were presented to the people we interviewed in Sprint 1 through video calls. With their feedback and by discussing within the project team we started combining aspects into a final concept.

5.6.2 Results

Foldable desk
Most people had minimal space at home to set up a workspace. We came up with the Foldable desk to try to design a concept that would take up as little space as possible when not in use. It would also be easy to carry, therefore increasing perceived flexibility, see Figure 11.

Acoustic catcher
While ideating on how to minimize disrupting sounds generated by others within the home, this concept of redirecting sound into a thick sound absorbent came up. The wall to redirect or bounce sound could also be used to hide the workspace giving it multiple functions, see Figure 12.

Suitcase
The suitcase idea was born from the question if the equipment used at the office and at home needed to be doubled up. What if the case that the equipment was carried with also was the workspace (Figure 13)? The result was a suitcase that could fit all necessary equipment and that you could use to put a laptop on which many do today to get a better angle to the screen. Another version of the concept came with an integrated monitor as well.

Secretaire 2
The idea of being able to close a workspace had much appeal to us and there were many aspects yet to solve such as how it would close and what it should be in its closed position. Therefore the concept idea was further iterated, see Figure 14.

Combining concepts
The fifth concept that we came up with borrowed many ideas from other concepts; ideas like being able to store equipment inside as in the suitcase and having the desk in two parts as in the first Secretaire. The idea of an integrated monitor as in the Foldable desk and the general shape from Secretaire 2 resulted in what would later become our final concept, i.e. Focus.

Figure 11
Foldable desk

Figure 12
Acoustic catcher

Figure 13
Suitcase

Figure 14
Secretaire 2

5.6.3 Discussion

The quote "validate early and often" is something we took to heart. For us it was an excellent way to gauge user opinions and the reasoning behind the opinions. Steve Blank's article seemed to be aiming towards this idea of testing different hypotheses with users which can be seen as almost the same thing, the difference being that Blank points out that it is a hypothesis that is being tested and not just an arbitrary check on whether a concept seems nice or not. The hypothesis should be a bit deeper than that, or you should at least test whether someone would buy the concept or even use it.

From the further ideation we went from user needs to user interactions and potential solutions. Through looking at what we could provide users with in order to fulfill their needs and what interactions would be needed to do so, we found a direction.

The bridge between the interactions and what medium to provide it through was the main point of generating ideas. We knew what we wanted to give the users need-fulfillment and what possible interactions would have to happen. Generating ideas around this and then validating them by asking users what they thought seemed like a good way forward. This was a difficult phase in the project because it is easy to start thinking of existing products that can be modified to fit the needs of the users. It is hard to keep things abstract and figure out the services a product can provide before deciding on a physical product. When we eventually decided on one concept to move further with, it got a lot easier.

5.7 Concept selection

Emotion, attachment to ideas and different kinds of bias can affect how we view ideas before they are adequately fleshed out. When we got to the point of selecting a concept to continue with, we avoided using evaluation matrices or other frameworks to aid us in the process.

Instead, we focused on the end user, not considering what concept we would like to develop but rather what could bring the most value to our hypothetical users. To ensure that we kept ourselves out of the equation, we compared our ideas to our findings throughout the process and weighed how much impact a concept could have compared to how different essential aspects were to impact.

The most crucial aspect to impact seemed in our minds to be work-related stress generated from working at home and its associated issues. The concept to proceed with also needed clear development potential and a clear vision for potential.

The concept we chose to progress with was the Secretarie. There were multiple reasons for this decision. In no particular order:

- It fits the existing product portfolio at Abstracta.
- There were a lot of potential, smart solutions that we could integrate into the design, like work lights.
- It could be made of sound-dampening materials.
- It allowed the user to close their workspace and remove the visual cues from work at home when not in usage.
- It allowed users to have a workspace with external monitors.
- It could help those most impacted by working from home, primarily those living in smaller homes.
- The feedback we got from our intended target audience was positive.

We wanted to improve the current situation of working from home, and there were clear benefits to the idea of hiding a workspace within a relatively small space without having to rely on other equipment like a kitchen table to put something on.

5.8 Prototyping

Prototyping helps identify essential aspects of a concept, find alternative solutions, and evaluate which solutions would work in reality (Stickdorn et al., 2018).

Once the key features from the combination and selection process were finalized we started to prototype in cardboard. With the same key aspects in mind, both members of the team set up to create one concept each. While being immersed in the building process we faced and solved many problems that we had not previously thought about such as how dimensions can affect workspace impressions. Once the prototypes were finished we moved on to user testing to be able to create more prototypes. We saw this as an iterative process where ideas could quickly be tested.

5.8.1 Methodology

To develop the concept further, we used rapid prototyping. By building quick prototypes in cardboard, we wanted to explore different ideas quickly and transform the concept from an abstract idea to something real and tangible.

It was decided that rather than building one prototype together, two prototypes would be built to test different aspects of the idea, give some creative freedom, and showcase the visions we both had for the concept.

In order to stay consistent with each other, certain aspects of the design were decided prior to the prototyping. These aspects were that the foundation should be box-like with a lid moving up and down. Other than those aspects, the creative freedom to explore was given, but of course, still restricted to the findings from earlier acquired knowledge about the users and their context.

The purpose was to define the concept for ourselves and to get more valuable feedback from users. To get as valuable information as possible, we created two versions of the prototype with some differences to see what the users would like and dislike with each of them.

5.8.2 Result

The prototyping and ideation work resulted in two prototypes, each with a different subgoal and thought process behind them.

Prototype 1
Prototype 1 was meant to test if slanted sides would give less of a claustrophobic feeling and also test how wide a workspace needs to be before it becomes an issue, see Figure 15.

Prototype 2
The goal with Prototype 2 was to maximize the work area while minimizing the floor area in its closed position, see Figure 16.

5.8.3 Discussion

When discussing design ideas, it is possible to get lost in abstraction and what we think may not equate to reality. To bridge the gap between abstraction and reality, both members of the project built a prototype representing their own vision of the concept.

Prototyping was, for us, a great way of defining a concept and finding issues that would not have been discovered merely by means of sketches and discussions. We used the process of building prototypes as a further ideation process. It is easy when ideating to think too abstractly about the ideas and it can be hard to ground them in a reality. That is why quick, low fidelity prototypes were the perfect tool for us at this point.

We wanted to prototype and user test to develop the concept further and to find out whether our chosen concept seemed interesting in physical form and what properties are important to users.

Figure 15
Prototype 1

Figure 16
Prototype 2

5.9 User testing

Prototyping is helpful to identify important aspects of a concept, finding alternative solutions and evaluate which solutions would work in reality (Stickdorn et al., 2018). Stickdorn and colleagues write about two types of prototyping; experience prototyping and imagine-like prototyping. Experience prototyping is creating low-fidelity environments, objects or other elements that can be interacted with. This allows the users to act the way they would in a future scenario and experience it themselves. Imagine-like prototyping can be used when actual interaction is not possible. Instead, the prototype can be a role-play, sketches and other elements used to convey a concept. This is used to help users who are testing the prototype to imagine what this would feel like (Stickdorn et al., 2018).

In contrast to user validation, user testing is more detail oriented because a concept has been chosen and it is the prototype of it that is being evaluated. During the user validation we merely asked about their interest for an idea. Now we were asking about which physical attributes were good, bad and why that is, and how users emotionally reacted to the prototypes. To make the prototypes slightly more realistic, we put them on a height adjustable table. This was also beneficial for seeing whether the impression changed when standing or sitting.

5.9.1 Methodology

The participants consisted of six people, four males in ages between 19 and 23, one male in the age of 50 and one female in the age of 21.

Our user testing process consisted of us preparing some questions to ask and some tasks for the user to perform. During testing we tried a more conversational level regarding their opinions of the concept while we simultaneously observed them interacting with the prototype.

The testing process started with us asking the participant to sit at the table and tell us about their first impressions, both practical and emotional impressions. This was followed up with some practical questions like where they would prefer to have outlets and buttons for height adjustments.

We also showed the participants a 3D visualization to imagine how the concept would fit in a home environment.

After one prototype was tested we then asked them to test the other one and compare the two.

5.9.2 Results

The users testing the prototypes said that they felt as though the workspace was its own room. This feeling differed slightly between the concepts and whether they were standing or sitting down, it had more of a room-feeling to it when sitting down. Some thought it was being too closed in, while others thought of it as a privacy component. Light seemed to affect this feeling as well.

Prototype 2 was a bit smaller in terms of proportion. Some thought there was enough space when sitting down but it felt smaller when they were standing up. Prototype 1 was experienced as being more luxurious because it provided more space. However, when asked about if they wanted to have something like this at home, its size was also something negative because it was considered too large in its folded setting. The users also thought that the concept would probably not be moved if they had it in their home.

Most liked the idea of being able to hide their workspace when not using it and saw the benefits it provided without us having to tell them about it.

5.9.3 Discussion

The user testing provided valuable information. The most valuable answer was generated from the question if the users would like to have something like the solution we showed in their home. We also showed them a 3D visualization so that they could imagine how it would fit into their home. More than any other question this got them to start talking about what they liked and disliked about the prototype, what changes they would want to make and who they thought would want to introduce something like this in their home.

We got a clear confirmation that the idea behind the concept was good and that the remaining work concerned primarily how well we could execute the concept.

5.10 Reflections on Sprint 3

In this sprint we decided on a concept by researching different key areas and ideated on how we could create enjoyment or pleasure for people when working from home.

Both prototyping and user testing helped us immensely. Through building and testing the concepts we ensured that we made the correct decision regarding which concept to continue with. As a way to further develop the concept, prototyping was an excellent path forward. Also from the user testing we learned a lot.

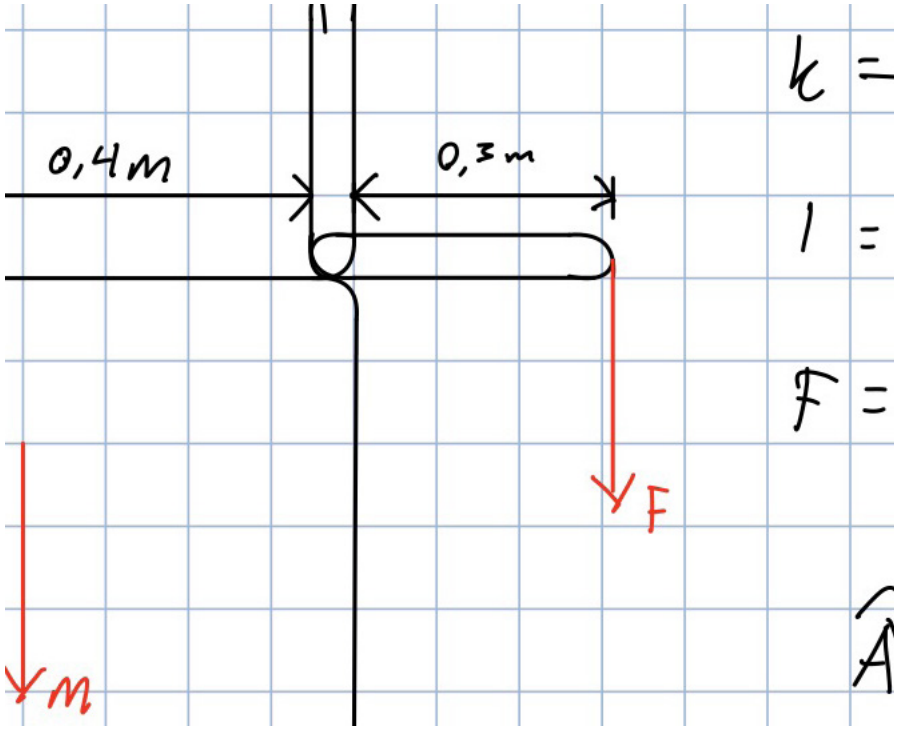
In the next sprint, we wanted to expand further on these new insights and build another prototype to validate shape and dimensions.However, there was still a lot of work left before the concept was finished, many details and practical aspects were left to decide.

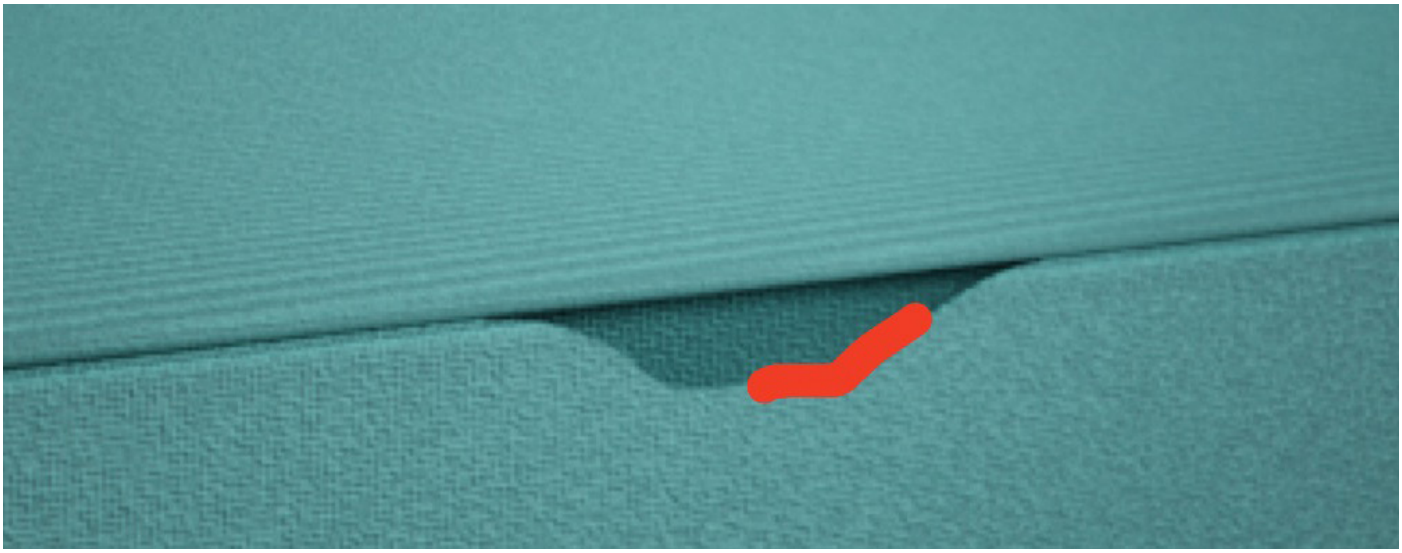
6. SPRINT 4

An idea is, in the end, only as good as its execution, and we knew that much work was needed to realize the potential we saw in the concept.

To start with, we gathered the information from our user testing of the prototypes in Sprint 3. With the input in mind, we built the third prototype to test certain design decisions and alterations we had considered.

In this chapter, we cover the third prototype, the second round of user testing and the detail design of the concept.





6.1 Benchmark

In order to find inspiration, identify opportunities and better understand what alternatives exist on the market we conducted a benchmark. A benchmark can be considered a structured process of measuring multiple aspects of a product or service.

6.1.1 Methodology

By searching for "secretaire", "hideable desk" and "foldable workspace" on Google images we found different variations of hideable workspaces. These were then analyzed in reference to our concept regarding which features they had and which they did not have. By analyzing this information we could reflect on which features our solution was missing and whether the identified features were providing additional use value or compromising another feature.

6.1.2 Results

Due to copyright issues, we are not able to show the products we analyzed. We did however categorize them as:

- Desk
- Foldable desk
- Multi-purpose desk
- Portable desk
- Cabinet/dresser
- Secretaire
- Luggage

The characteristics we identified and compared with our concept were:

- Storage capability
- Supports ergonomic work
- Physical space of product
- Flexibility, multiple use cases or movable

The desks we found offered some storage. The ability to be used for other purposes when not in use such as tables which made them somewhat hideable. However, they were quite restricted in terms of sideways leg room and they were also depicted as standing towards a wall which would also restrict leg room.

The foldable desks used very little floor area but required to be wall mounted. They did have storage space but were somewhat restrictive in leg room, either sideways or forward due to being wall mounted.

Multi-purpose desks could hide their workspaces and work as a different table top when closed. This created the possibility of hiding some equipment and they offered plenty of leg room.

Portable desks do not require any floor space and were easy to move and carry. However, they do not offer much, if any, storage. They take advantage of existing surfaces or could be used on their own when sitting on a sofa, for example.

Cabinets/dressers, which are workspaces built into dressers or cabinets, are more or less permanently in one place. They offer lots of storage in cabinets under the table top which restricts leg room. The workspaces are well hidden.

Luggage are compact and somewhat moveable, probably hard to move if fully loaded. They are hideable, have storage ability and can be traveled with. This sort of workspace is quite small.

The secretaires offered storage and the possibility to place some decorative elements on top. They were possible to move around, at least to some degree. They did not offer any space for external monitors and workspace was in general quite small.

6.1.3 Conclusions

There were four features found in the benchmark that our concept did not offer:

1. Possibility to be carried/portable

2. Possibility to work from one's sofa

3. File storage

4. Alternative usages

The products analyzed in the benchmark had these things in common:

1. Poor or no support for external monitors

2. No height adjustment

3. No integrated light

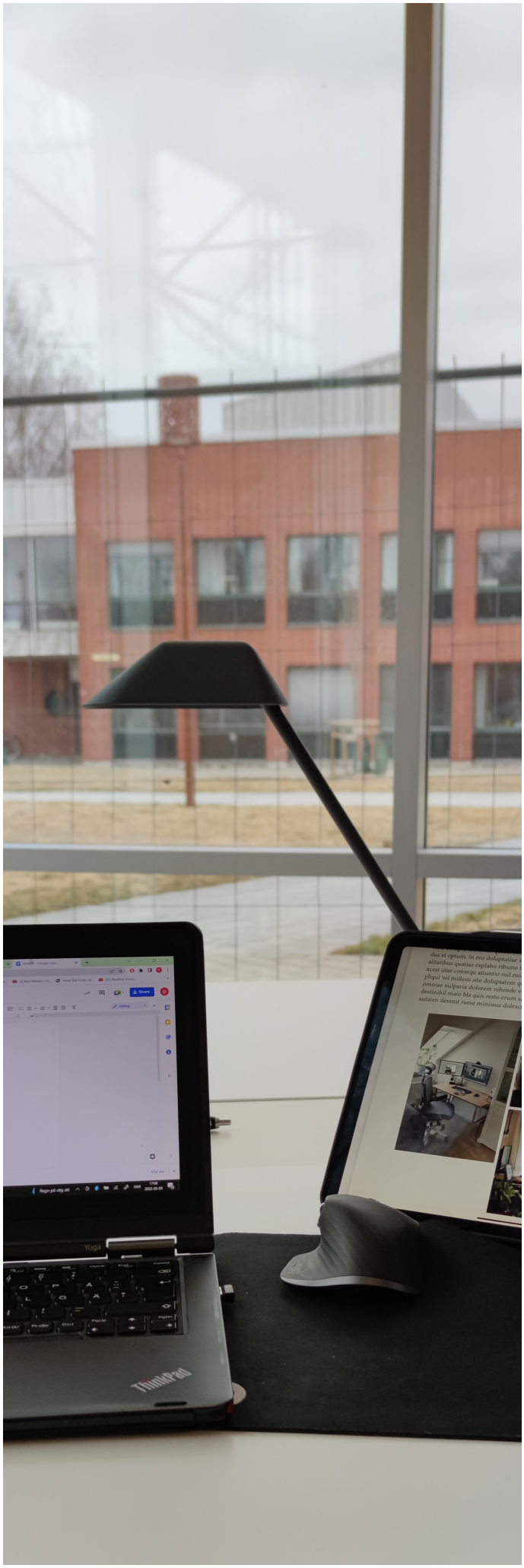
The novelty in our concept seemed to be the hideability feature, perhaps combined with electronic height adjustment.

6.1.4 Discussion

A benchmark is usually performed quite early in a project. In our case the road from brief to deciding what market segment we wanted to target was traveled quite far and therefore the late benchmark.

A benefit of such a late benchmark was that we understood the market, user and user needs quite well at this point. Therefore we could look at the market with a better understanding than we otherwise would have had.

Based on the benchmark we seemed to have found a white spot even though there are some actors in the market space.



6.2 Prototype 3

The results of testing the previous prototypes left us with some insights into what worked and what did not. Therefore a new prototype was built to incorporate aspects from previous prototypes and integrate new ideas. The dimensions were changed to what we hoped was a sweet spot between working area and volume when closed, and some design elements were also changed to merge the sense of room described by concept 2 and openness from concept 1 (see Figures 15 and 16). We also created mockups for different monitor sizes (27", 29" and 34" ultrawide), to test if the perception of space changed with different monitor sizes.

Once the new prototype was finished, a new round of user testing was initiated.

6.3 User evaluation

Eight students and two professors participated, they were aged between 19 and 54 years old.

During the evaluation we encouraged the participants to express their feelings, thoughts and opinions. The format was a semi structured interview, with a focus on user experience, similar to previous user testing.

After the participants had evaluated the cardboard prototype, we showed them a rendered 3D visualization of the concept, dimensioned to match the prototype. This was done to gauge the concept's design language and bridge the potential gap between how the prototype was interpreted and how we envisioned the concept.

A typical evaluation session lasted between 15 and 30 minutes.

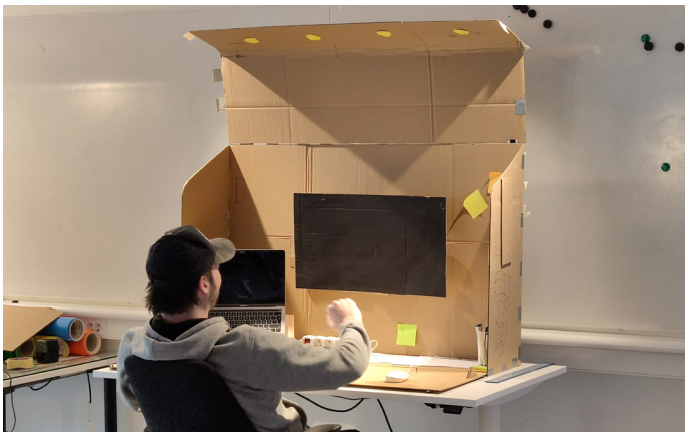


Figure 17
Prototype 3

6.3.1 Results

A common consensus among the participants was that they saw a tangible value in the concept, and most were very optimistic about the utility of hiding their workspace. Most participants were happy with the size, and those who wished that it was bigger also expressed that they thought that a bigger size would, to some extent, defeat the purpose of it being hideable. Participants also appreciated the different monitor sizes because many were used to the larger monitors.

When shown the 3D rendering, the participants expressed that they liked the aesthetics, and most said that with different color options, it would fit in their homes. They also liked that it did not feel like a box on legs.

6.3.2 Discussion

It would have been more fitting to do prototype evaluations with business professionals, which is the intended target demographic. However, due to logistics and time constraints, we did not do this. However, to some capacity, most people work or have worked from home, which includes the students and professors who participated. Therefore we concluded that insights generated from the user evaluation were valid and reliable, and on which we could base further design decisions.

Prior to the construction of Prototype 3, we had discussions about the dimensions of the prototype. It boils down to whether we would build it in the dimensions we thought would be optimal to maximize work performance and minimize floor area when closed or test how small or big it can be before users express dissatisfaction. Since our schedule was tight and the project scope did not force us to perfect the concept, we instead went with our guess of optimal size.

With this validation, we moved on to the detailed design which we could not test using cardboard.

6.4 Detail design

When moving into detail design, we had the basics decided, like the dimensions and the most significant functions, but there were still a lot of details and questions to figure out. An idea is said to be only as good as its execution, and we took that to heart.

Detail design included practical aspects like weight distribution and hinges but also small details such as where power outlets, buttons to adjust height and dimmers for lighting would be located. Much of the resulting detailed design was based on iterative development, testing, intuition and knowledge from previous sprints.

6.4.1 Process

Stability

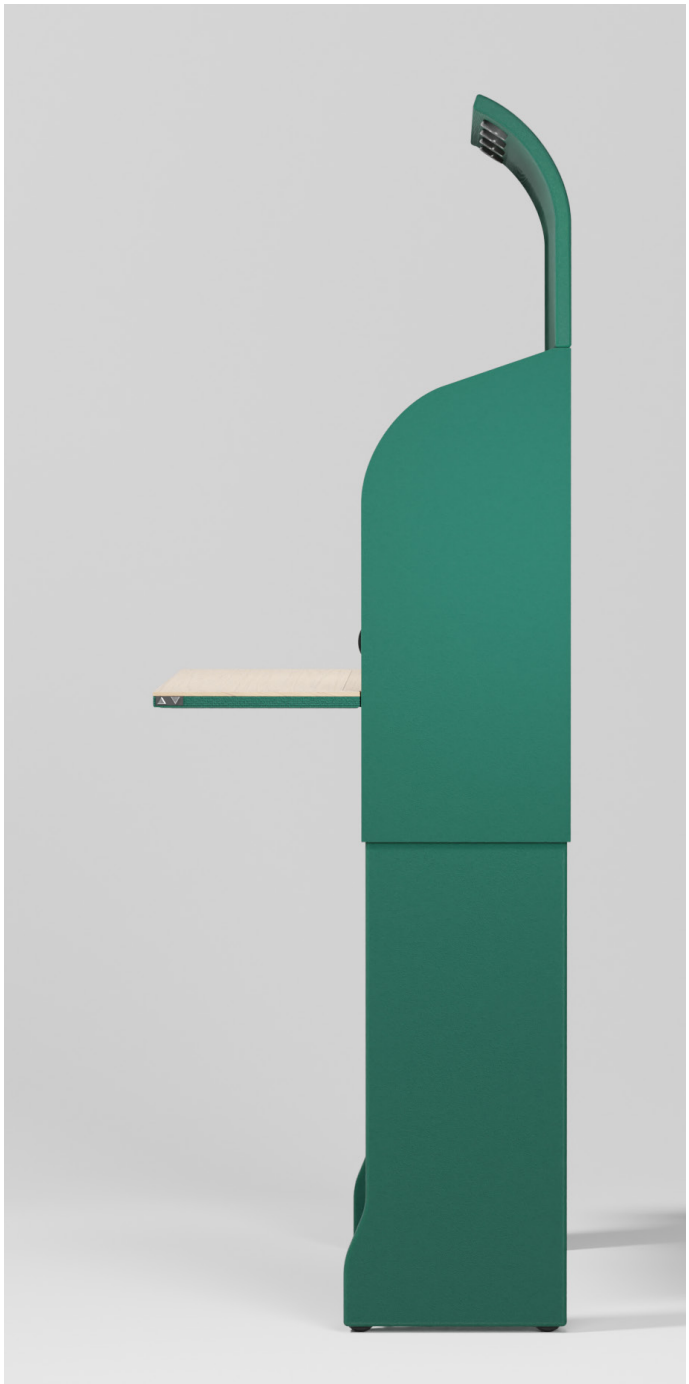
One of our primary concerns was whether the solution could fall over. With our desired design, we wanted to avoid protruding feet. This meant that the end of the desk would have a 40 cm lever on the furthest support of the workstation. To investigate if tipping could be possible, we started approximating the workstation's weight and centre of mass. We found that My Hive from Abstracta, which is somewhat similar in size and function, weighs 55 kg. If our concept weighed the same, it would take a load of 30 kg to fall over, which was cause for concern. We therefore tested how much load is usually applied to a desk when leaning heavily on it. We found that the weight rarely superseded 20 kg.

We considered multiple solutions for ensuring that the workstation will not fall over. One was to extend the feet. Moving them 10 cm forward would increase the required load to the workstation to 50 kg. Another solution would be to mount it to a wall with screws. However, this would remove the ability to move the workstation quickly and easily.

Therefore, further testing was still required to evaluate how severe the problem is and if any design changes were needed.

Opening mechanism

We wanted to make the concept accessible through one interaction only. Instead of having to fold down the table top and fold the top up, we thought about how this could be done in one motion. In some metal cabinets, there is a locking mechanism that moves two pins in opposite directions when turned. This could be implemented to fold the two parts simultaneously with one movement. The two parts would react to each other and create counterweights, therefore not requiring much force. This mechanism would also help support the table top and take up some of the strains from the hinges.



Hinges

Longevity in a product is not only positive for a company's reputation, it is also positive for the environment since unnecessary waste due to poor design is something to be avoided.

The hinges were the most probable part of the workspace that could affect its lifespan as they will experience a lot of strain. The problem does not disappear if the hinges are strong enough, then the problem will be transferred to the points of attachment instead. We needed to ensure that the hinges and where they were attached had enough strength not to wear too easily. There will always be a limit to mechanical strength, so we wanted to ensure that the limit was sufficient for regular use.

Opening handle

The workspace needed a handle to open, but we wanted to maintain a minimalistic aesthetic when closed. To accommodate easy opening, we decided to have a handle integrated within the front frame (see Figure 18).

Height adjustments

In Sprint 2, we interviewed a person that had a manual height adjustable table using a crank to change from sitting to standing table height. He said that he did it less frequently than he otherwise would have due to the extra steps involved in adjusting the height. This was a clue that even with electronic motors adjusting height, the placement of buttons must be in an easy-to-reach and natural position. We also wanted the users to have the ability to change the height of the workspace when in its closed position. We, therefore, decided that the optimal placement would be on the side of the desk, being easy to reach and with buttons shaped as triangles to make it possible to feel what each button does without seeing them. In its closed position, the upper one will increase the height, and the lower one will decrease.

Movability

The possibility to move the workstation from one place to another is one of the significant benefits of the proposed solution. It increases flexibility and enables the user to use the concept in locations other than where it is stored when not in use. The concept was estimated to weigh around 50 kg, so the only option to move it is with wheels. It had to be able to move through doorways, so the wheels had to rotate to accommodate this.

The wheels also had to be lockable. We tested different movable tables and their locking mechanisms and deemed that only two of the four wheels needed to be locked. The locking mechanism had to be placed in a spot making it possible for the user to unlock or lock when standing or sitting. The optimal placement from a usability and aesthetics perspective was decided to be at the inside of the legs, see Figure 19.

Figure 18
Handle

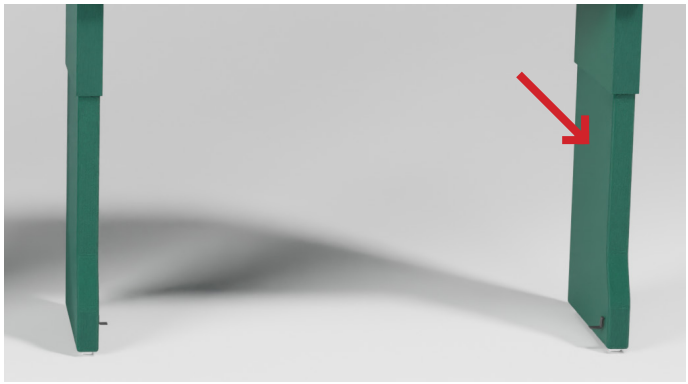


Figure 19
Wheel locking

Lighting

For many reasons it is important to have optimal lighting conditions when working, and only offering one level of light for all different situations in which the workspace might be used would not provide a positive user experience. Therefore a dimmer was required so that the user can adjust the brightness. We wanted this action to be easy to do. We also wanted the user to be visually reminded to adjust the brightness throughout a workday. Therefore the dimmer was placed on the side of the workstation and oriented so that it could be adjusted with the right hand without the user having to rotate their wrist (see Figure 20).

6.4.2 Discussion

Our detail design process first focused on the big and important components like hinges or wheels. It took work to determine what was within the project's scope.

For example, some of the detail design that focused on usability we put a lot of thought and effort into, like how the opening mechanism should work. This was to find out if it was at all possible. One of the major reasons for going deep into the issue of balance was that we did not want to develop a concept that was not feasible in reality. The interactions that affect user experience are based on what is optimal for the user but still with production feasibility and cost in mind.

We are not by any means experts in construction and manufacturing, and there are likely many changes that would need to be made in order to be able to manufacture the concept that we could not foresee. To develop the concept even further, we would need a bigger team with experience in multiple fields, more time and resources. The limitation we set for the project was that the final concept should be possible to manufacture, and we consider that the goal has been reached.

Figure 20
Dimmer

7. THE FINAL CONCEPT

7.1 Focus

The final concept is named Focus, a mobile workspace meant to alleviate many problems usually associated with working from home. Traditionally, having a well-equipped workspace would mean having a large desk visible at all times. However, having a good working environment would often be in conflict with having a good home environment. We wanted to find a way for anyone to have a good work environment without compromising their homes.

Focus is a complete workspace that brings a unique value proposition. When more pressure is placed on employers to provide good working conditions at home for their employees, there is an uncertainty about what having a large desk, monitors and other equipment will do to someone's home. Focus is a solution that attempts to solve work-life balance and several other problems associated with working from home.

7.1.1 A complete workspace at home

Today many people have suboptimal working conditions when working from home. Often they sit at kitchen tables or small desks. Some do not consider working this way a problem and argue that there are other benefits of working from home, so why do users need a well-equipped workspace?

There are multiple benefits to work from a proper workspace, but to drive home the point let us do a thought experiment. Let us say that you, the reader, landed a new job and on your first day got a laptop and then was directed to sit at the lunch table permanently. You did not get a desk, monitor or any other equipment required to work, you had to focus over long periods of time and avoid work-related injuries like an aching back. Would you embrace this and be happy or start looking for another employer?

If you work two days a week from home, i.e., 40% of your work hours or 16 hours a week, is it acceptable to sit at your kitchen table? How long would it take before your back started to hurt? Perhaps it would take a few years, but eventually, it would lead to serious problems.

Having a proper workspace that provides you with the ability to sit and stand, your neck at a good angle with an external monitor and somewhere to store your equipment notes and whatever else you need to work efficiently, is a major benefit to anyone.

7.1.2 Work-life balance

Throughout the whole project, we have heard about people struggling with balancing their work and private life when working from home, looking at e-mails late in the evening, working more hours than required and being stressed after work. Some even felt guilty when not managing to complete their work-related goals and worked weekends. Most said this was not the case before starting working from home. Some tackled this problem by adopting routines like “fake your commute” and taking a walk before and after work helped them to change their headspace, from an “I am at work” mentality to an “I am home” mentality. However, only a minority of people used this technique or something like it and with varied results.

That is why we thought it was important to make it easier to manage this balance through mental association and provide something to tie the idea of work to without being distracted when not working. Our solution comes with two aspects, the ability to open and close the workspace which will act as routine and an extra step to make the distinction easier, but also the sense of room which was described in the user tests of the prototype. We suspect that this feeling of entering a different room will be enhanced further with a real product since the materials and thickness of the walls should feel more substantial than the prototype cardboard box.

Managing this balance between work life and personal life is crucial to maintain a healthy life and is one of the main benefits of this concept.

7.1.3 Hiding in plain sight

Being able to close and disguise the workplace is good for the work life balance by not constantly reminding users of their work. A standard desk with proper equipment can often ruin the atmosphere, having a desk in your bedroom or living room can make it harder to relax. From what we have heard, this is often the case with people living in apartments where space is scarce. For those living in houses, there are other problems like having to, what was described as, sacrifice a room for work. The advantage of having a separate room is that you can just close the door so as to not remind you of work during leisure.

Our concept in its closed position is designed to not show the workspace, to not remind users of work and to be discrete in most rooms. This enables users to have their workspace in most rooms. Often we heard users complaining that they sat at a suboptimal place or room just to be able to fit a desk and not to disrupt the feeling of the home. Our concept allows users to sit in whatever room they desire without feeling that it impacts the impression of their homes. This also removed the need to "sacrifice" a room for work.

7.1.4 Being messy

When considering user experience in design, it is easy to be crude and only aim to address evident problems like ergonomics. In this project, we instead tried to think of what the user would do if they could do so, not what they explicitly would express in an interview but what we, as designers, find from drawing conclusions. It is a subtle and abstract distinction but has profound and serious implications on design.

In our case, we found a tendency for people to be messy and disorganized in a somewhat organized manner. We suspect this is a by-product of how people work, and having papers, notes, post-its and other tools readily available enhances their ability to keep trains of thought. The conflict comes when they feel like they cannot be messy while working because they have to clean up every day after a workday is finished. Providing tools to make it easy to organize is part of a solution, but it is not the entire answer.

By being able to close your workspace we give the users the ability to be messy without their workspace looking messy when not working. This is a unique trait rarely seen in other setups.

7.1.5 Movability

We wanted the users to have the ability to be flexible about where the workspace is placed. Likely, the place where Focus will be stored when not used will not be the desired location to work. Therefore, it is equipped with wheels that can swivel to enable it to be moved through door openings or within a room. The wheels are also lockable with a pedal on the inside of the frame.

7.1.6 Height adjustable

Having the workspace height adjustable was a requirement from interviews with users. It provides many benefits such as being able to stand or sit but it also makes the workspace suitable for people of any height. The height adjusting mechanism is hidden within the legs of Focus and it is possible to adjust height, independent of whether the station is open or closed. The mechanism also provides weight to the station, making it more stable.

7.1.7 Monitor

Focus will come with a detachable monitor arm that enables the user to adjust height, tilt, and move the monitor from side to side. The monitor arm will attach to the monitor using VESA[1] standard mounting. In the case that the user wants to use more than one monitor, it is possible to change the monitor arm to suit those needs. Some users may prefer to use their laptop in front of the monitor, and the ability to adjust height also allows for a more custom setup.

7.1.8 Materials

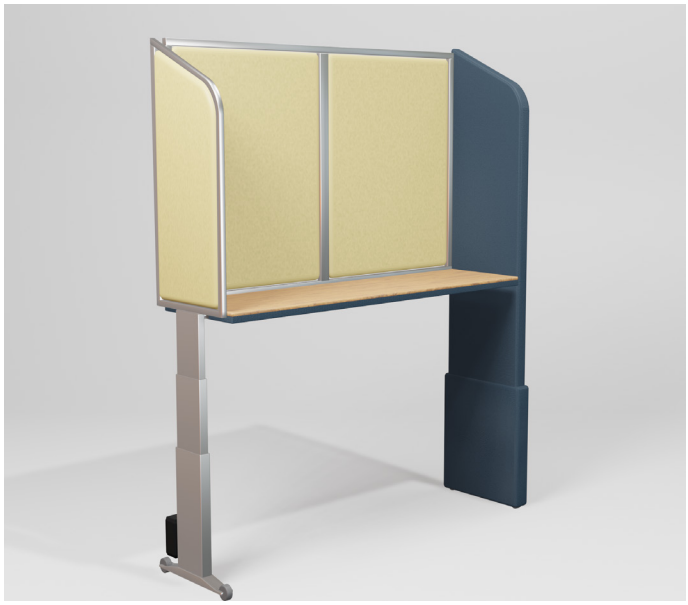
For Focus to fit in homes with varied furnishings and themes, it needs to come in different colors and materials. Abstracta already provides their products with different kinds of textiles to choose from and have also used custom materials by request from customers. Focus can be done in one color tone or different on different parts depending on customer requirements for it to fit into their homes.

The frame will be made in a combination of wood and steel to provide enough strength to support the folding part of the table.

1 https://www.vesa-standard.com/index.html

7.1.9 Sound absorbing

Focus is, in addition to a workspace, also a sound absorbent. There are many different types of distractions that people face when working from home. The sound generated by others within the home was often the most prominent distraction and irritation. By absorbing some of the noise from talking in meetings or phone calls directly before it has a chance to spread, we hope to make a meaningful impact. Measuring how much of an impact it makes is beyond this project's scope. When Focus is in its closed position, it also acts as a sound absorbent equivalent to the impact a sofa has on a room, according to experts from Abstracta.



7.1.10 Lighting

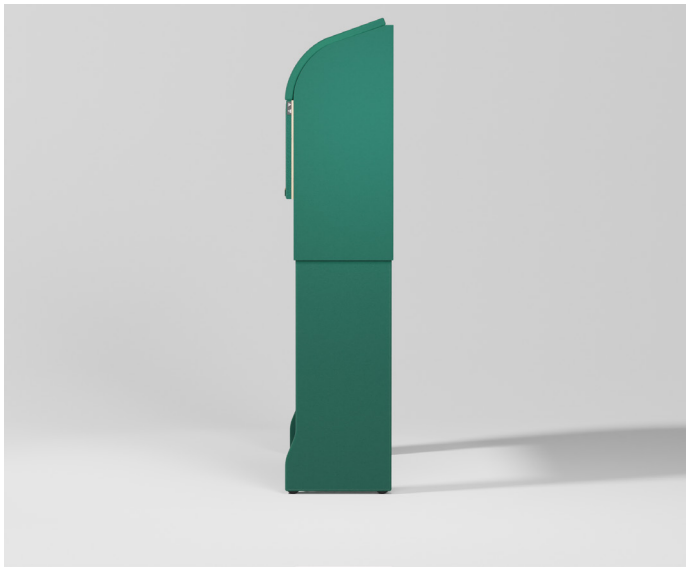
There are four spotlights integrated into Focus to provide optimal lighting conditions for work. Illumination levels have been shown to greatly impact visual comfort and productivity (Kaushik et al., 2021). Participants in the interviews often expressed dissatisfaction with how poorly their workspace was lit when working from home compared to the illumination in their offices. Good lighting conditions are hard to achieve without much work, a regular desk lamp provides high illumination in a small area which leads to unfavourable luminal contrasts. The light from lamps in a room is often centered in the middle which also leads to poor lighting conditions for work unless the workspace is located beneath the light source which rarely is the situation.

Focus comes with dimmable light which is directed to light the entire desk without causing glare in monitor screens or dazzle the person using the workspace. The lights are controllable with a dimmer so the user can adapt the intensity of the light to their needs.

7.1.11 Shape and dimensions

The shape and dimensions of Focus were decided based on prototyping and user testing. Since the concept comes with a mounted monitor arm, it is always possible to move the monitor closer but not further away than the depth of the workspace. The depth is based on information from the Swedish Work Environment Authority. They recommend a distance of 50 – 80 cm between the eyes and the computer monitor (Arbetsmiljöverket, 2022), they also mention that a common distance is 70 cm (Arbetsmiljöverket, 1998). Therefore the depth was decided to be 70 cm. Which, after user testing, was deemed to be satisfactory. The non-folding part of the desk has a depth of 30 cm which means that it will fit a 17" laptop or an A4 paper on its long side.

The concept's width is 120 cm and the height, excluding the legs, is 70 cm. With the concept open, the height increases a lot, with the standard ceiling height of 230 cm in apartments, a person of 2 meters can use the workstation standing without it hitting the ceiling.



7.2 Use scenarios

7.2.1 At home

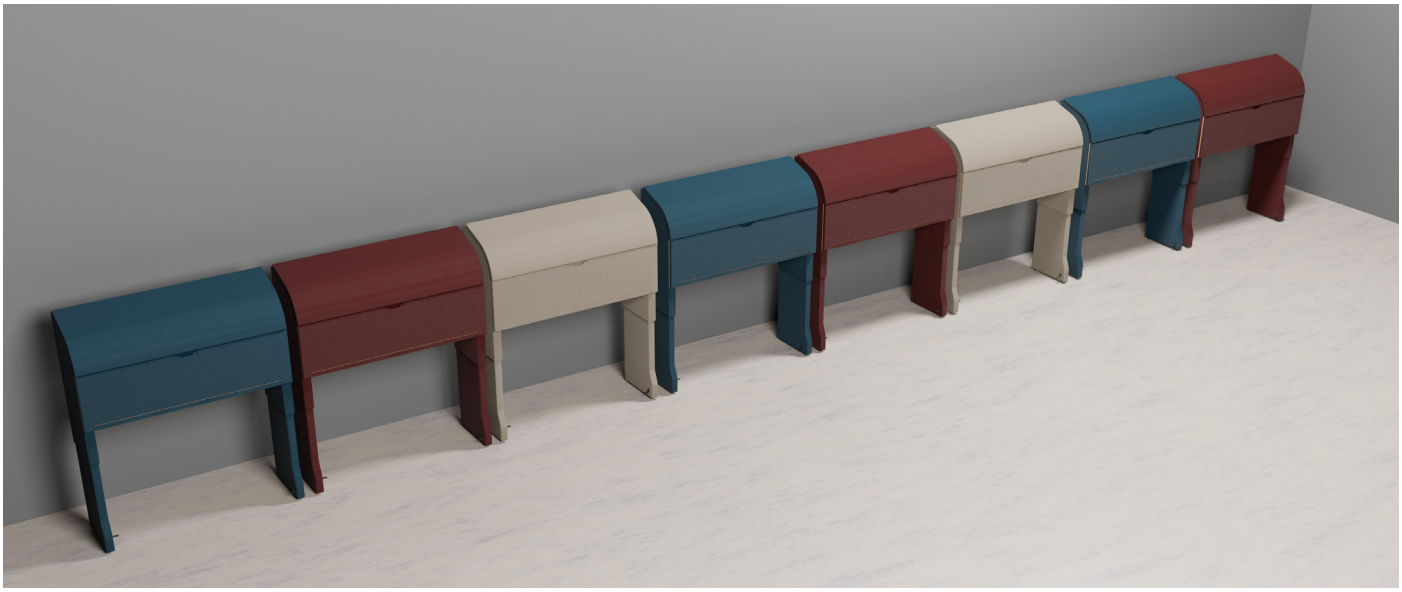
Each home is unique but most people working from home experience similar problems, the stress of having to see your workplace during leisure or sacrificing a room, sitting at the kitchen table or something similar. Let us start off with a scenario in a smaller apartment, without Focus they would previously have needed a desk in the living room or bedroom neither of which is ample space to have one so the result was to sit at the kitchen table. By sitting at the kitchen table which is used for other things as well there is no way to have a second monitor since removing it every day is seen as too much work.

With Focus, the workspace is stored in a corner in the bedroom so it is never in the way, most days the user uses the workspace in the bedroom. When there is a meeting the background of a bed feels like a breach of privacy so then the user moves the workspace into the living room.

7.2.2 At the office

When more people start working from home some days a week the need for office space declines and office space is often expensive. According to a report from Sveriges ingenjörer the average cost of office space for one employee is 60 000 SEK per year, so it is not surprising that many companies will try to decrease that cost (Sveriges ingenjörer, 2021). This is also combined with the move towards activity based office layouts, both of these factors will decrease the amount of desks in an office.

This is where Focus comes in, with its small use of floor area it is possible to have multiple individual workspaces stored within a space efficient area. They can be moved to a more suitable location when necessary, this enables the employees to still have their own workspace when needed.



7.3 Further developments

7.3.1 Accessories

There are many possible accessories that could be added to Focus depending on what needs the user have. Some of the accessories we want to include are:

- Battery pack to make the workspace less dependent from power outlets
- Paper sorter
- Shelfs
- Attachable trash can

7.3.2 Cable management

To avoid unnecessary cable clutter, monitor cables will be routed within the frame, between the desk surface and the back wall there will be a hollowed out section for routing cables.

7.3.3 Connectivity

The workstation has an integrated outlet making it easy to get power to multiple different gadgets without having to use a wall outlet.

8. GENERAL DISCUSSION

8.1 Working from home: a new landscape

That covid had a big impact on society is not a surprise to anyone, but some of the second-hand effects of staying at home might be. Our objective in this project was to investigate how the working conditions have changed, and what new opportunities and challenges have arisen.

By blending the border between work and private life many felt that they had more time available, working from home resulted in more individual freedom and more overall time since commuting was in effect eliminated. At the same time those who lived in homes with less available space, suffered from poor working conditions. They were often left with two alternatives, either work from a preexisting location at home like a kitchen table or try to fit a proper workstation.

From an ergonomic perspective, sitting at a kitchen table with a laptop is not sustainable but at the same time having a proper workspace would require non-available space. When talking about space it is important to remember that there are different aspects to space. When packing a car physical space is key, the luggage has to fit. But in a home, visual space is often more important.

Visual space is often hard to define but easy to spot. There needs to be some coherence to the spaces in which we live. This is the angle we took in this project.

8.2 The future of working from home

The trend of working from home has grown over the years and was accelerated by the pandemic. From talking to professionals and note what companies are saying, we conclude that working from home is here to stay. To what extent professionals will work from home will, in large part, be dependent on the individual and the company.

The trend right now seems to indicate that working from home will on average be 40% of a full-time job that would otherwise have been done in an office. When considering that a full-time job roughly equals 2000 hours a year, the problem of working from a kitchen table becomes apparent.

8.3 Disruptive innovations

When dealing with a new and future market, it is important to be on the lookout for disruptive innovations that could make your concept obsolete. As long as a tabletop and a computer will be required for work we predict that our concept will be relevant. There is a lot of talk currently about the metaverse but that will most likely take a lot of time before it is the norm in work culture.

8.4 Improving the home atmosphere

Working from home does to some extent, require professionals to adapt their homes to accommodate the needs for working. This can be in the form of having a dedicated work area or temporarily transforming a preexisting area for work. With this adaptation, there will always be sacrifices needed to make the transformation.

People with higher income often live in bigger homes which enables them to use a spare room for work. When talking to this category of users this seemed to be a powerful contributing factor to maintaining a healthy work and private life balance. On the other hand, those living in smaller apartments seemed to have difficulties maintaining this balance and experienced more work-related stress in their free time.

Having a healthy work-life balance has seemingly become dependent on socioeconomic factors, for us this was a highly motivating insight that led us to seek solutions to help those who need it the most. By reducing the physical and visual space used by a workspace, we strived to improve work-life balance independent of socioeconomic factors.

8.5 Societal considerations

This project aimed to take advantage of the societal change where people have been working full-time from home and now work from home about two days a week. During this project we understood that the situation we were designing for was just about to start, it was the start of a new era of how people will conduct work. Instead of trying to forecast how people will work from home in five years, we could affect how people will work from home in five years. Our aim became to affect this in as positive a way as possible. There have been discussions about employers' ability to cut down on office space due to everyone not being in the office at the same time anymore. This might become an issue if, one day, everyone comes into the office and the amount of workspaces is insufficient. Having a set of our concepts will make it possible to provide people with workspaces quickly.

Our concept aims to improve work-life balance at home which became an increasing issue during the pandemic. Our concept achieves this aim by hiding the workplace. We think that this will have a positive effect on the majority and further strengthen these boundaries between work life and personal life.

Abstracta's development and production is located in Lammhult, a modest village in Sweden. Innovation for them could mean increased profits which can result in more jobs outside large cities and increased prosperity for the community around Abstracta.

At the same time, having moveable workspaces in an office might mean that offices cut down too much on space, maybe not even having offices anymore.

8.6 Ethics

It is seemingly positive that production is mainly in Sweden which is known to have good working conditions. Most suppliers also have production in Sweden, however, we can not guarantee that all parts will be produced in Sweden. Some components might be produced in nations with poor working conditions and poor risk management that could affect those communities negatively.

Abstracta produces relatively high-end products, which might spark questions regarding differences in socio-economic classes where the upper-class can afford more expensive products. Abstracta has a business-to-business (B2B) business model and therefore it will probably not be individuals purchasing this product but their employers.

Different impairments and limitations have not been evaluated in this project, but we realize now that our product is compatible with the use of wheelchairs at the very least.

Through interviews where people were asked about what they would change in order to create a better environment for working from home, they said that they would buy a different home to have a separate room for working. This would mean that people would pay more rent just to have a space dedicated for their employer. With our concept that development is not necessary. Some rumors we have heard is that architects of new apartment buildings design apartments with extra rooms, this does not seem like a sustainable development when also taking inflation of the economy into account.

During interviews, the cultural probe and user validations we received personal information from the participants. It has been made clear to them that the information only will be available to us and remain anonymous to everyone else. These promises were made because the participants would not otherwise had participated or given us the useful information we needed. We have tried our best to make sure that this was completely optional and if they did not want to share some information, they did not have to do so.

8.7 Ecology

Abstracta's production works towards ecological sustainability by using left-over material as fillment for sound absorption in their products. Besides this they send scrap wood and metal back to their suppliers for them to recycle. By cooperating with local suppliers the environmental impact from transport is quite small.

Longevity of products has a substantial effect on the environmental impact a product has in comparison to its lifetime. By ensuring that the most mechanically stressed components like hinges are dimensioned to be operational over a long period of time the negative environmental effect can be minimized.

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APPENDIX 1
Project brief

Brief för examensarbete

Abstracta utvecklar idag akustikprodukter för kontor och offentlig miljö. Vi arbetar tajt med akustikexperter och ljudlabb i utvecklingen av våra produkter.

Vi har under en längre tid upplevt en stor global trend där arbetsplatser i större utsträckning går mot aktivitetsbaserade kontor. Effekter av pandemin tillsammans med ökad digitalisering har gjort att fler och fler personer går från ett aktivitetsbaserat kontor till en aktivitetsbaserad arbetsplats. Enligt studien Hybriduniversum av Atrium Ljungberg 2021 beskrivs detta som ”från aktivitetsbaserat till relationsbaserat”. Arbetsplatsen beror på vilken arbetsaktivitet som ska utföras. Är det digitala möten sitter man med fördel hemma, är det eget arbete sitter man hemma eller i särskilda fokus-arbetsplatser på kontoret och ska man ha fysiska möten sitter man i miljöer avsedda för detta.

Abstracta har idag ett stort sortiment av skärmväggar och tysta rum som passar bra för fokusarbete i kontorsmiljö. Vi har även ett brett sortiment av akustikprodukter för mötesrum för att skapa ett bra ljudlandskap i mötet mellan människor. Det vi saknar i framtiden är produkter avsedda för arbete i hemmiljö. Här ställs helt andra krav på vilken typ av produkt som tilltalar att använda hemma.

Abstracta eftersträvar alltid att försöka få med flera funktioner i produkten så önskvärt vore en produkt som förutom akustikegenskaper även kan kombinera flera aspekter för arbetsmiljö. Exempel på dessa kan vara belysning, skrivtavla, anslagstavla, växter, förvaring eller teknik-relaterade delar som monitorfäste, kabelhantering, videokonferensutrustning osv.

Inom akustik arbetar vi idag med fyra olika delar. Absorption (ljudabsorberande material), diffusion (hårda material i former som splittrar ljudvågorna), dämpning (hindra ljudet att spridas) samt att hindra ljudet från att uppstå (inget oljud från produkterna, tysta bordskivor eller produkter och inredningar som inbjuder till tystare samtal).

Vi ser gärna att ni är öppna kring utforskandet av nya material eller metoder för att skapa en akustikprodukt. Idag består majoriteten av akustikprodukterna på marknaden av porösa material eventuellt klädda i textil. Oftast används ett material av polyester eller mineralull men här finns stora möjligheter att hitta förnyelsebara material. Det finns även fler sätt att skapa absorption, tex mikroperforering eller Helmholtz teknik. Man kan även bygga en produkt baserad på diffusion eller dämpning där istället hårda material används.

Abstracta har stora ambitioner gällande hållbarhet med miljöcertifierade produkter, återbruksprogram och plan för koldioxidneutralitet. Det är därför viktigt att stor hänsyn tas till hållbarhet vid framtagning av nya produkter.

Ert uppdrag är att utifrån informationen ovan ta fram ett koncept på en attraktiv produkt för fokusarbete eller digitala möten som passar för hemmakontoret.

APPENDIX 2
Interview questions

ARBETE HEMIFRÅN

Start
Berätta om dig själv
Ålder

Arbete

Boende (storlek, typ, familj)

Hur länge har du arbetat hemifrån?

Hur många dagar i veckan arbetar du hemifrån?

Miljö
Skulle du kunna förklara lite hur du arbetar hemifrån och visa runt eller ta bilder med telefonen och skicka senare?

Vad ger ditt jobb dig för hälpmedel för att kunna jobba hemifrån?

Brukar du enbart jobba där du sitter nu eller gör du visst arbete på andra ställen i hemmet? (specifika uppgifter?)

Hur är miljön när du arbetar hemma gentemot på kontoret? (ljud, luft, socialt, ergonomi…)

Gillar du att ha din arbetsmiljö ren och organiserad eller är du mer rörig utav dig?

Vad är dom bästa egenskaperna i ditt hem för att arbeta? Har du några smarta lösningar som du uppskattar?

Vad är dom bästa egenskaperna på ditt kontor för att arbeta?

Finns det saker hemma som gör att du tappar fokus?

Tycker du det är svårt att separera mellan hem och arbete när du jobbar hemifrån?

Vad fungerar dåligt med att arbeta hemma? (exempelvis fryser om fötterna, sol i ögonen, dålig stol…)

Vad stör du dig mest på när du jobbar hemifrån?

Vad uppskattar du mest med att jobba hemifrån?

Vad är ditt bästa minne under tiden du jobbat hemifrån?

När du jobbar hemifrån vill du att det ska kännas som en mysig hemmamiljö eller en mer professionell miljö?

Vad tycker du är de viktigaste aspekterna i en miljö för att kunna utföra arbete?

Tycker du att ljuset är bra på din arbetsplats?

Produktivitet
Upplever du att du är mer eller mindre produktiv när du arbetar hemifrån?

Finns det vissa arbetsuppgifter som är mer eller mindre effektiva att göra hemifrån?

Framtiden
När pandemin är över, hade du velat fortsätta arbeta hemifrån? I så fall, till vilken utsträckning? Varför?

Vilka arbetsuppgifter hade du velat göra på kontoret och vilka hade du velat göra hemma?

Vilka förbättringar hade du velat göra i ditt hem för framtiden om det blir en trend att jobba hemifrån?

Om din arbetsgivare kommer behöva bidra med utrustning till ditt hem i framtiden till större utsträckning än idag, vad hade du velat ha?

Produkter
Viktiga aspekter för produkter till hemarbete? (inredning, bekvämt, pro, färgtema, funktion etc)

Vi skriver just nu ett examensarbete i samarbete med Abstracta som fokuserar på akustiken i olika miljöer. De integrerar ljudabsorberande egenskaper i produkter förutom avgränsade skärmar (skärmdela och visa hemsidan).

Vad tycker du om att introducera produkter som har ljudabsorberande funktioner i hemmet?

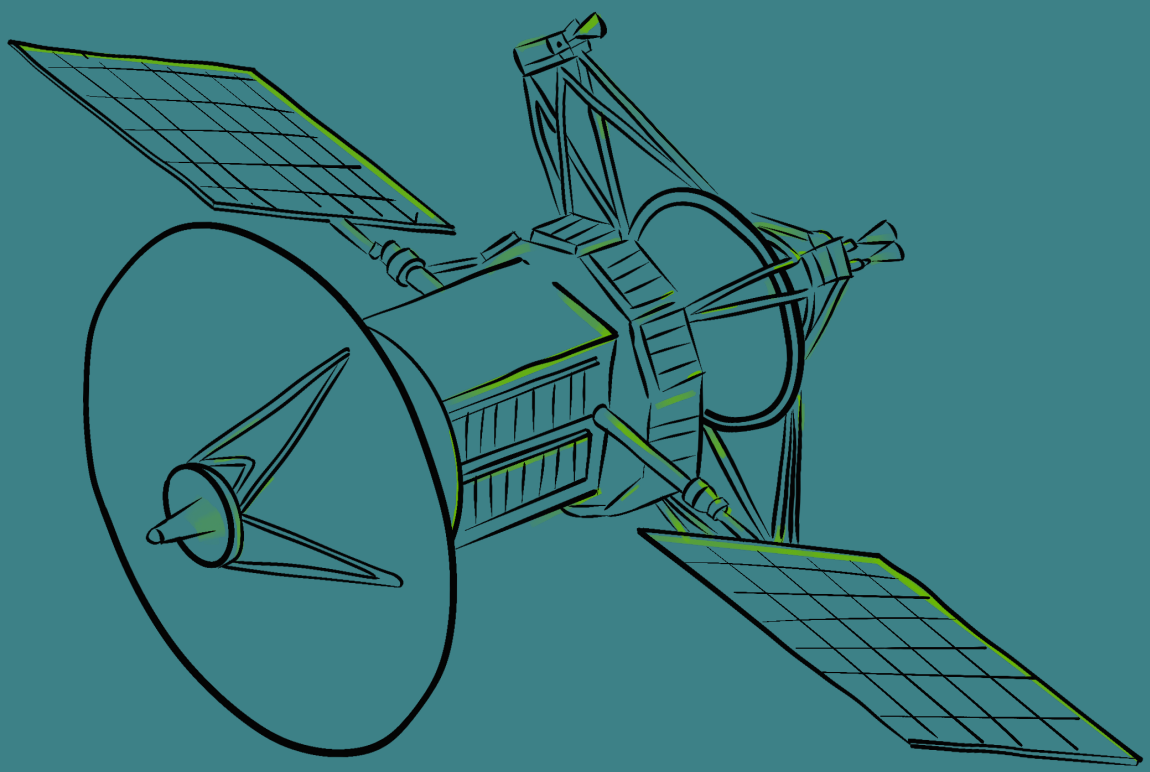
Har du några idéer på produkter man skulle kunna integrera ljudabsorbenter i för att göra hemmiljön bättre?

Hade du velat avgränsa din arbetsyta från resten av hemmet?

Har du några andra tankar eller erfarenhet om att arbeta hemifrån som skulle kunna vara relevant för oss?

APPENDIX 3
Cultural probe

Kultursond



Hej! Under de kommande fyra dagarna kommer du att få genomföra olika uppdrag där du ska reflektera över hur det är att arbeta hemifrån. Vi som skickat ut paketet är David och Isak, vi genomför just nu vårt examensarbete inom teknisk design. Medskickat i paketet har du en bok med olika uppgifter samt utrymme att skriva i och 3 pennor. Vissa uppgifter kommer be dig att ta bilder som du kan skicka via mail eller sms till oss på:

isarun-5@student.ltu.se
070-061 55 62

davbej-5@student.ltu.se
076-278 38 85

Om du under veckan känner att du inte hinner med någon av uppgifterna behöver du inte känna dig pressad att göra dem, gör de du hinner med. Vi kommer hålla i en workshop på ert kontor på torsdag eftermiddag 03/03, ta med denna bok ifylld till det.

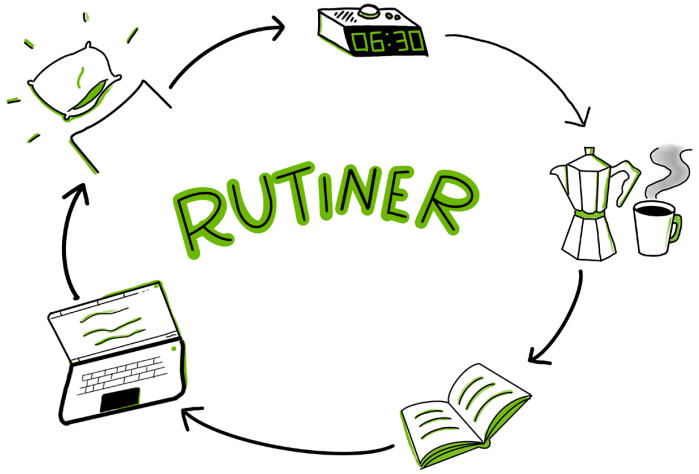
Har du några frågor så tveka inte på att höra av dig.
Lycka till!

Vad är en Kultursond?

En kultursond är en forskningsmetod som hjälper oss att förstå vardagliga utmaningar, mål och behov hos personer. Du som deltagare dokumenterar och reflekterar själv över vissa aspekter i din vardag under en tid, i detta fall fyra dagar. Eftersom den här metoden hjälper oss att få en inblick i din vardag hoppas vi få ta del av dina tankar och åsikter, detta gör sondundersökningar särskilt värdefulla för oss.

Uppgifterna i detta häfte är utformade för att genomföras under dagar när du arbetar hemifrån. Vi rekommenderar att du genomför ungefär ett uppslag per dag, dagarna som är markerade i hörnen på varje uppslag är bara rekommendationer från oss. Det går att utföra uppgifterna även under dagar när du är inne på kontoret. Om du genomför uppgifter när du är på kontoret, svara gärna med utgångspunkt i när du senast jobbade hemifrån.

Examensarbetet handlar om att förbättra hur människor jobbar hemifrån och hur det kommer att fungera i framtiden.



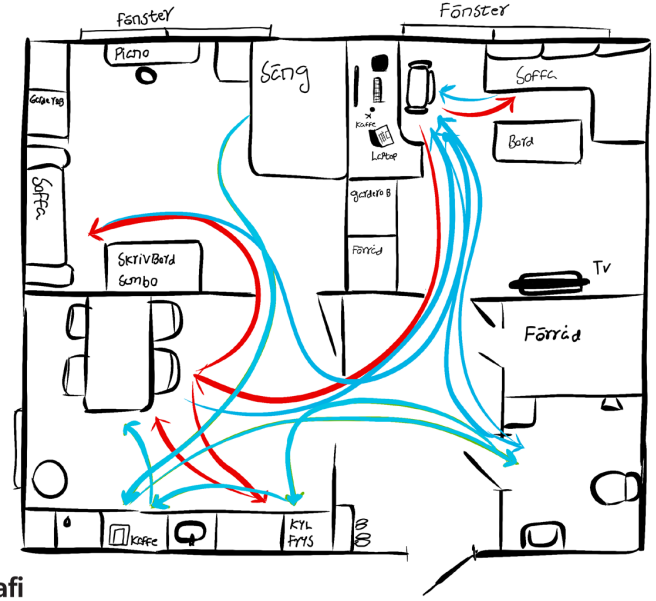
Rita planlösning

Hur du arbetar hemifrån är till stor del baserat på vilka möjligheter du har i ditt hem, vi vill därför att du ritar din planlösning på nästa sida, använd exempelbilden nedan som inspiration.

När du är klar kan du, med de inkluderade pennorna, rita linjer för hur du normalt rör dig i hemmet under en arbetsdag.

Blå under arbete

Röd är rast



Fotografi

Vi är intresserade av att se hur det ser ut där du arbetar när du arbetar hemifrån. Ta gärna ett foto på din arbetsyta utan att piffa till den för mycket och skicka sedan bilden till oss.

Tycker du att det är stökigt? Städa upp litegrann, förklara hur du organiserar din arbetsyta och ta ett nytt foto som du också skickar till oss.

Hur organiserar du din arbetsyta?

Rutiner och test

Rutiner skapas både medvetet och omedvetet, tänk på vilka rutiner du har under en dag. Skriv i kronologisk ordning ner de viktigaste rutinerna du utför under en arbetsdag när du arbetar hemifrån.

Finns det rutiner som du önskar att du hade?

Här har du några förslag på rutiner, testa en eller flera av dessa eller gör något annat som du känner för under en dag och skriv ned vad du tyckte.

- **Låtsaspendla**

Ta en promenad före eller efter arbetsdagen, det kan hjälpa till att både påbörja och avsluta arbetsdagen.

- **Skalmans klocka**

Det är lätt att missa de små pauserna man normalt sett tar på arbetsplatsen, sätt en timer som påminner dig att sträcka på benen.

- **Sociala samtal**

Ring upp någon du arbetar med som du haft mindre kontakt med under pandemin.

- **Meditera**

Ta några minuter av din dag för att andas och meditera.

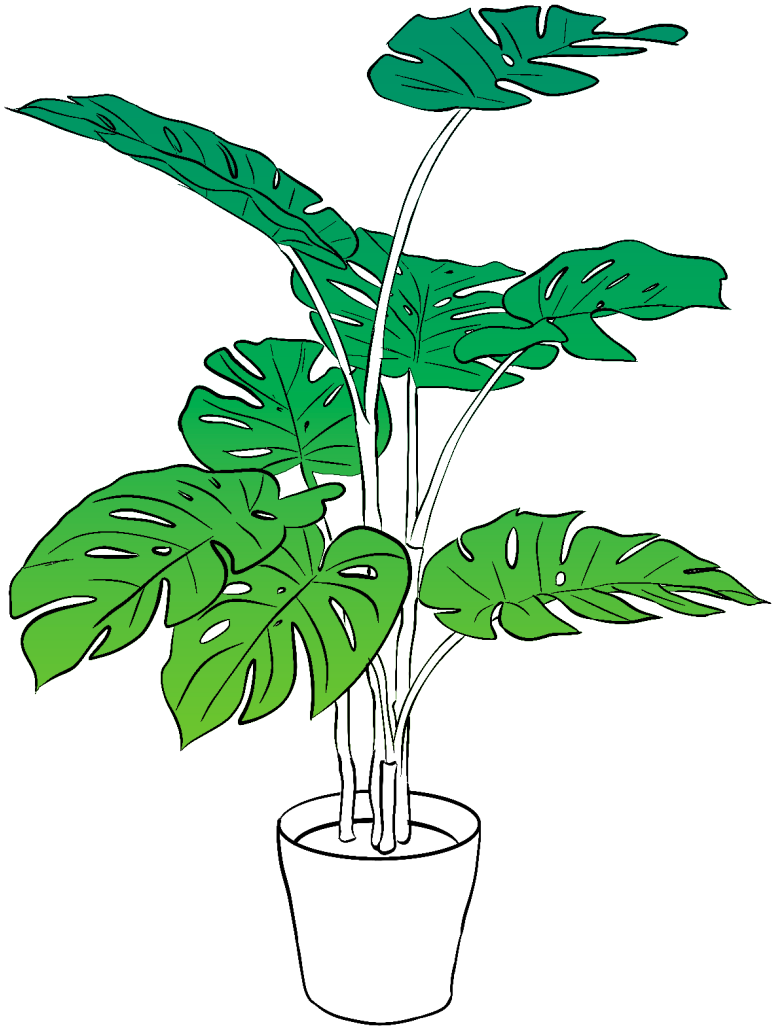
- **Ljud**

Lyssna på avslappnande ljud som förslagsvis fågelkvitter, vågor eller regn.

Vilka är dina viktigaste rutiner?

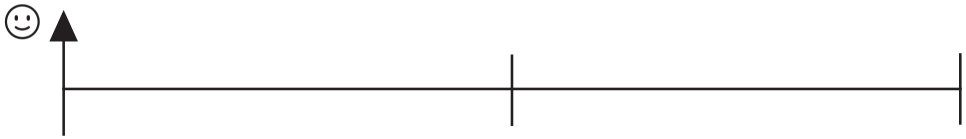
Vilka rutiner önskade du att du hade?

Har du provat något nytt? Vad tyckte du?



Dag 2

Försök att tänka igenom hur din dag har varit, när var du lite gladare och när var du lite mer nere? Rita på denna tidslinje hur ditt humör eller din energi har ändrats under dagen.



Start på arbetsdagen Lunch Slut på arbetsdagen

Berätta lite om vad som gjorde att du blev piggare, gladare, tröttare och nere under dagen.

Hur många koppar kaffe drack du idag?

Hur många växter har du hemma?

Hade du velat ha fler växter?

Ja Nej

Hur många möten har du på en

Bra dag? _____ Dålig dag? _____

Arbetsyta

Med en laptop och mobiltelefon som arbetsverktyg kan nästan vad som helst användas som arbetsyta, som exempelvis skrivbord, köksbord, soffbord, i ditt knä eller något annat.

Berätta mer om platsen eller platserna du jobbar vid hemifrån. Du har troligtvis en plats i ditt hem där du utför det mesta av ditt arbete, varför har du valt att sitta där? Hur är det egentligen med den näst bästa platsen då, prova att sitta där en stund, en timme eller en eftermiddag, finns det något som är bättre där än på den första platsen? Vad är det som gör den platsen till nummer två och inte nummer ett?

Det finns mycket som gör det möjligt att kunna arbeta effektivt hemifrån också som exempelvis internetuppkoppling, behaglig temperatur och yta att vara på. Vilka saker i ditt hem hade du inte kunnat vara utan för att genomföra arbete?

Vid vilken plats gör du det mesta av ditt arbete hemifrån samt vad är för- och nackdelarna där?

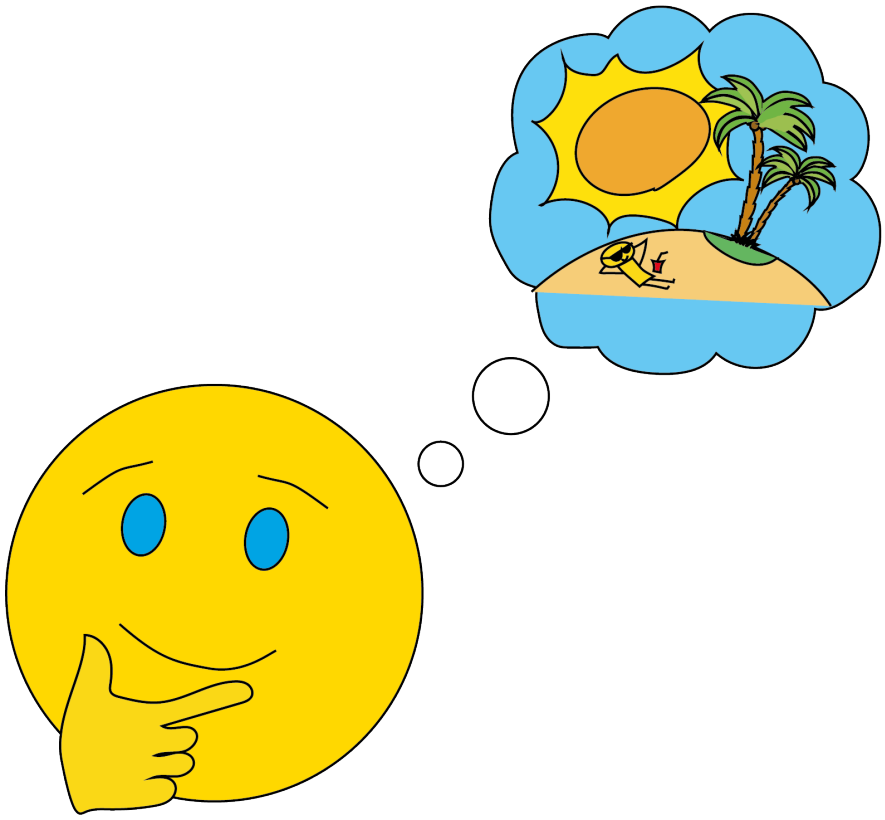
Vilken är den näst bästa platsen samt vad är för- och nackdelarna där?

Vad hade du inte kunnat vara utan i ditt hem för att genomföra arbete?

Drömmar

Har du något nyårslöfte? Någonting du strävar mot? Eller bara något du vill försöka bli lite bättre på? Berätta gärna. Vi vill gärna veta om dina drömmar och ambitioner men också om vilka utmaningar det innebär.

Finns det saker du brukar göra som du inte tänker på? Fenomenet brukar kallas att gå på autopilot men vad gör du när du går på autopilot? Exempelvis kan det vara saker som att snurra i stolen, nynna på en låt eller leka med en stressboll. Om du inte redan vet, försök tänka på det under en eftermiddag och berätta vad du kommer på.



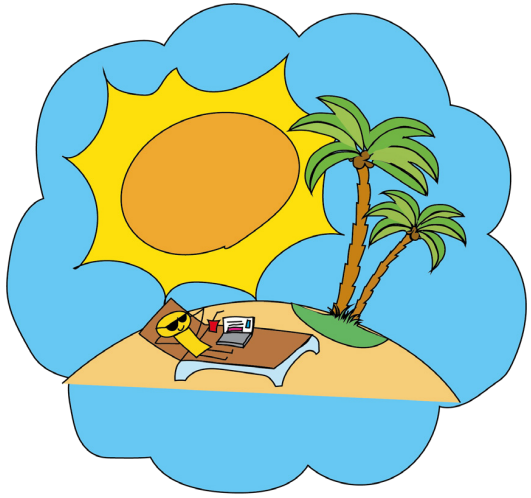
Vad har du för mål eller drömmar?

Vad är utmaningarna med att uppnå dessa?

Vad du gör på autopilot?

Den perfekta arbetsplatsen

Nu vill vi höra lite om vad som skulle vara det optimala stället för dig att jobba på om du fick helt fria tyglar att välja vart du skulle jobba och hur det skulle se ut. Rita gärna här nedanför om du vill.



Vad hade varit den perfekta arbetsplatsen för dig?

Finns det några nackdelar med den arbetsplatsen?

Vad är de största fördelarna med den arbetsplatsen?

Om du känner dig inspirerad under veckan får du gärna fylla i tankar, idéer eller något annat som du känner för här.

Valfritt utrymme, fortsätt skriva, rita eller gör något annat i denna ruta.

Ta med detta häfte till workshopen på torsdag.

DEPARTMENT OF INDUSTRIAL AND MATERIALS SCIENCE
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