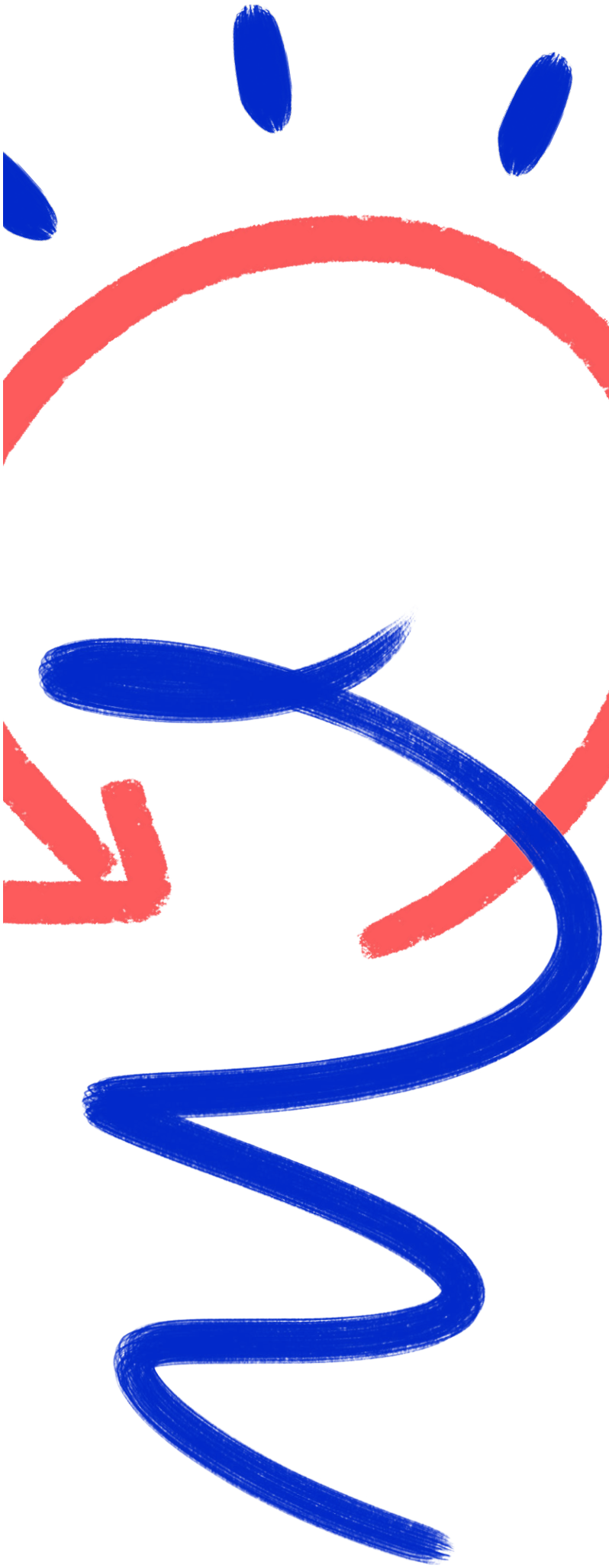

Sketching for Remote Collaboration

Master Thesis

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Date: 10.07.20

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Furthermore, all the individuals that participated in the tests have to be thanked, both for their time and for accepting the challenges that they were faced with during the tests.

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Finally, my parents have to be thanked. My mother for proofreading the report, and my father for showing curiosity for the project, and for the many interesting conversations along the way.

Abstract

This project explored sketching for remote collaboration, with the goal of enabling the design agency Idean to use sketching actively in their remote workshops. To achieve this goal, the focus of the project was on developing a toolkit for sketching in remote workshops. The development of the toolkit was divided into three phases - a research phase, an experiment phase and a synthesis phase.

Figure 1. The type of sketches that are the subject of this project are simple hand drawn sketches

In the research phase several benefits of sketching that the toolkit should promote were found, as well as drawbacks of sketching that the toolkit should mitigate. The Integrated Creative Problem-Solving theory was studied, to identify how the toolkit can be integrated with the creative process of Idean's workshops. Remote collaboration was studied in order to identify which considerations had to be taken into account when moving from face to face to remote workshops. In addition to this, the Theory of Planned Behaviour was studied, in order to figure out how the toolkit could promote the use of sketching in remote workshops.

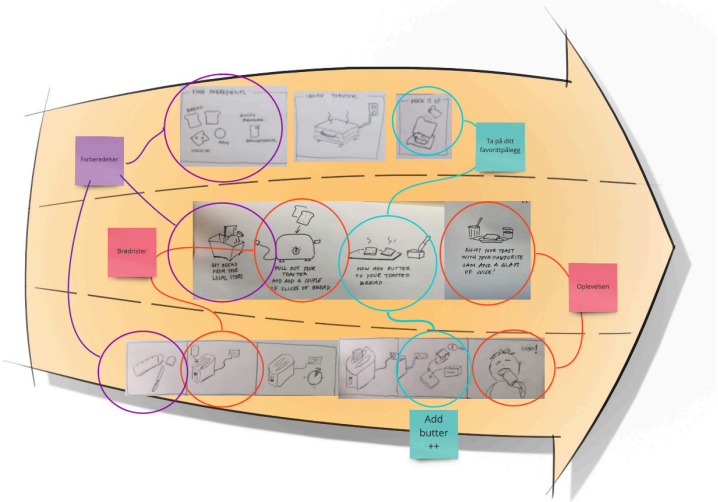


Figure 2. The activities that were developed use both analouge sketchign, as well as collaboration in a digital whiteboard

The experiment phase was conducted through three sprints where the toolkit was developed. The first sprint was concerned with the practical challenges of creating and collaborating by means of sketches in a remote workshop. The second sprint tackled the challenge of creating meaningful activities around sketching in remote workshops. Finally, the third sprint further developed the activities, in addition to tackling how to warm up the participants' sketching abilities and how to capture the value of the sketching activities for use beyond the workshop.

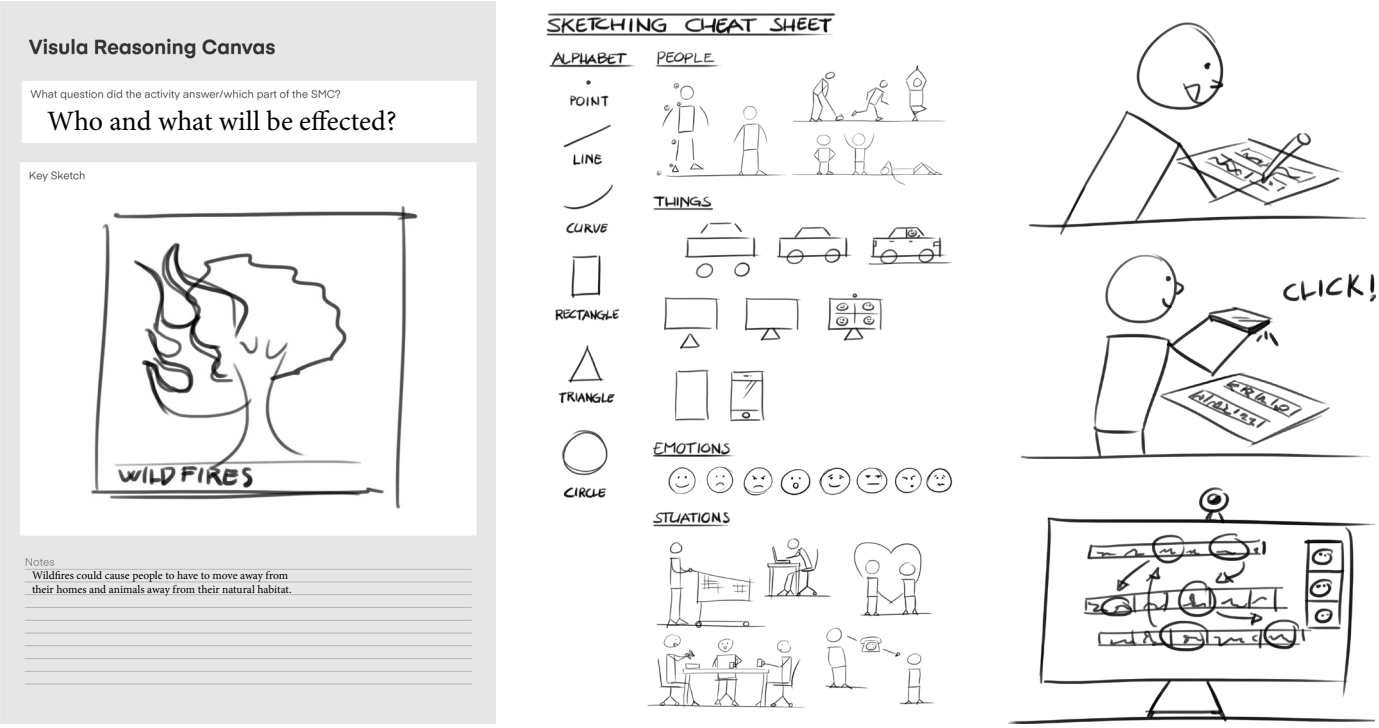


Figure 3. the visual reasoning canvas, the sketching cheat sheet and the analouge first sketchign method, three important elements of the toolkit

In the synthesis phase the different solutions that were developed in the experiment phase were revised based on the insights from all three sprints, and the solutions were compiled into a toolkit.

The toolkit includes sketching instructions, a method for creating and collaborating around sketches, sketching activities, guidelines on how to structure the activities and guidelines on how to capture the value of the activities for use beyond the workshop. The different components of the toolkit provide structure to the different aspects of including sketching in remote workshops, while promoting the benefits of sketching. In this way, the toolkit provides both the facilitator and the participants in the workshop with the control needed to use sketching in remote workshops, in order to achieve meaningful outcomes.

Contents

1 Introduction

Sketches make thoughts tangible, so that everyone can see and understand them. In a *Creative Problem Solving* (CPS) process this could be a benefit if it enabled everyone involved to understand and build on each other's thoughts. However, CPS workshops are starting to be conducted in remote settings. This poses new boundaries for using sketching in these workshops, as the participants in these workshops aren't in the same physical space, making it hard to create and share sketches. This project looks at how to enable the use sketches in remote CPS workshops, so that the outcomes of these workshops can be further enhanced.

1.1 Sketching and CPS

Sketching is a way of exploring and communicating ideas (Buxton, 2007). The type of sketches that are the subject of this project are hand drawn sketches. These types of sketches are defined by their ability to be created rapidly at any given time. Because of this they are also inexpensive to make and disposable if the result isn't as desired. Their meaning is conveyed in relation to other sketches, they are open and invite interpretation. They have a style that clearly shows that it is a sketch and they are only refined to the level that is required to communicate the intended information and the degree of development of the idea (Buxton, 2007).

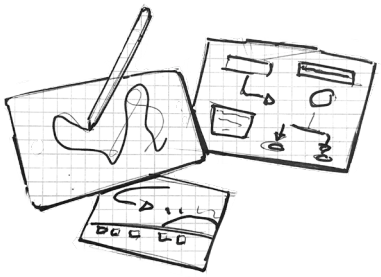


Figure 4. The type of sketches that are the subject of this project are simple hand drawn sketches

Creative problem solving (CPS) is a discipline that seeks to create innovation by developing new ideas for open-ended problems. CPS is done in a group context, where the group goes through an organized process and arrives at a novel solution to the given problem. The group stimulates each other so that they can come up with as many new ideas as possible. One or two of these ideas will be developed further, and become the solutions that will be implemented (Buijs & van der Meer, 2013).

Using sketching in a collaborative setting will later be seen to have many functions that can be beneficial to the CPS process. The primary function that sketching has, that is not present in verbal techniques is that it has the ability to make thoughts tangible. As a result of this, sketching has several other functions that enable it to create a better understanding and new insights between the people that are collaborating.

Sketching will also be seen as not being without potential pitfalls, when introduced into a team collaboration. These pitfalls are that the team members will hold back ideas that they don't think are worth sketching, that sketching will take the attention away from the collaboration (Van Der Lugt, 2001) and that they will have a general hesitation to sketch (Cohn, 2014), both of which will slow down the CPS process and the collaboration.

These insights lead us to the first opportunity that is seen between sketching and CPS.

Opportunity 1:
By helping create insights and understanding within the group, it is anticipated that sketching will help the CPS process by enabling teams to move through the CPS process together, with the whole team aware of the decisions that are being made and the direction that the collaboration is taking.

Figure 5. Shared understanding

1.2 Idean

The design agency Idean was the collaboration partner for this project. This means that the problem statement was focused towards their practice and that the design outcome was focused on being implemented within Idean. Idean's involvement in the project consisted of access to and guidance from Idean employees, observations of their working methods and testing of design solutions with Idean employees.

idean
Part of Capgemini Invent

Figure 6. The design agency Idean was the collaborative partner for this projectIdean

Idean is an international agency with more than 700 designers and with 18 studios spread across Europe, America and Asia. The spirit of the agency is to be "fearlessly human", which means that they

“embrace human imperfections” and want to “challenge what’s possible” (Idean, 2019). They provide a range of design services centred around digital solutions. Their services range from user experience design and user interface design, to design thinking and service design.

Idean is a subsidiary of Capgemini Invent, which is the management consulting part of the Capgemini Group. Idean was acquired by the Capgemini Group in 2017, in order to strengthen Capgemini’s user-centred, experience design and strategy services.

In addition to Invent, Capgemini also has the brands Sogeti and Altran, which work with digital consulting and engineering consulting. Idean operates independently from Capgemini Invent, as well as independently from the other parts of the company. Nevertheless, many projects are also done in collaboration with other parts of Capgemini. In preliminary interviews at Idean, designers Stine Halvorsen and Eivind Thorsen expressed that it is quite normal that other parts of Capgemini have a project for a client, and that Idean becomes a part of that project after it has been running for some time. Well into the project Capgemini and their client will realize that they could benefit from having some design competencies in the project, and in that way Idean will also be included in the projects.

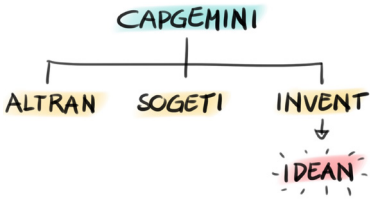


Figure 7. Idean is subsidiary of Capgemini Invent

Idean has a value of being fearless, and the designers described this as manifesting itself in that they meet their clients with constructive questions and challenge what the clients ask of them. Compared to Idean’s fearless attitude, their clients are described as quite conservative, and its Idean’s role to push for innovative and forward-thinking projects.

Workshops are used regularly throughout projects as an arena where Idean can explore and create innovative opportunities together with their clients. The most prominent creative workshops are at the start of the project, where the design team explores the problem, and possible solutions for the project, together with the client, thereby laying the foundation and the scope of the project.

The designers also mentioned how these workshops often surprised the clients, by getting them to think in a different way than what

they usually do. Working visually is one of the ways of working that the clients aren't used to and that surprise them. Creative director of Idean Norway, Joachim Svela, is of the opinion that everyone should sketch in the workshops. This is because it forces the clients to take a more active role in the workshop. It avoids them only participating with comments and criticism and forces them to be active in the design process of the workshop.

This leads us to the second opportunity that is seen, regarding Idean's practice Sketching and CPS.

Opportunity 2:
By using sketching actively in their workshops, Idean will have more engagement and reach earlier consensus with their clients, because the clients are more actively participating in the workshop.

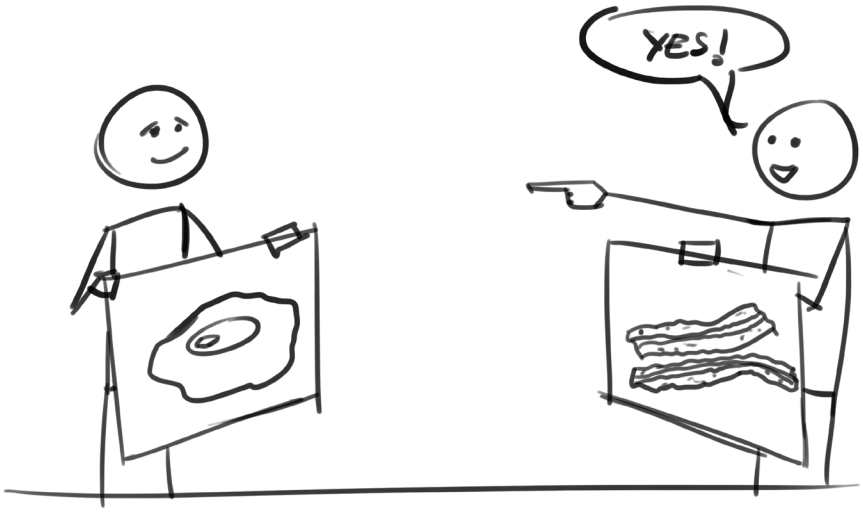


Figure 8. Concensus

1.3 Remote Collaboration

The type of workshop that this project was focused on was remote workshops, that are done digitally, and where all the participants are situated in different locations. In remote collaboration people are situated in different geographical locations and collaborate using *ICT* (Information and Communication technology) software. In Idean's remote workshops, the group used video conferencing software and a digital whiteboard to communicate and collaborate.

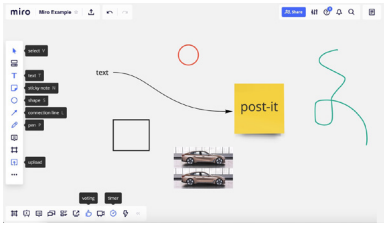


Figure 9. Digital whiteboard in Miro

The project coincided with the Covid-19 pandemic, and it was therefore a sudden necessity for Idean to conduct their workshops remotely. (A full account of how this effected the project can be found

in Appendix A). As we will see later, remote collaboration was an unfamiliar situation both for Idean and their clients.

We will see that, sketching and visualization was absent from the collaboration and there was no defined practice for how to use sketching in these remote situations. In addition to this, we will see that the communication is more challenging in remote settings, because a lot of nonverbal communication is lost, leading to a challenge in regulating discussions.

This leads us to the third opportunity, regarding sketching and remote collaboration.

Opportunity 3
Sketching can alleviate some of the difficulty of verbal communication in remote workshops, by giving the participants a second means of communication.

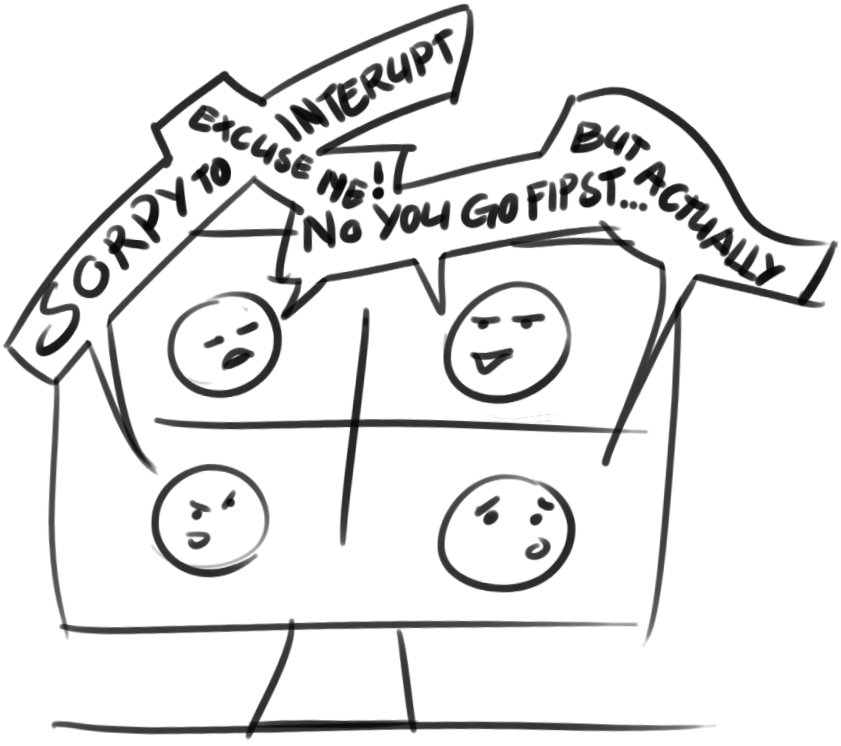


Figure 10. In remote collaboration verbal communication becomes more difficult

1.4 Problem as Perceived

Based on these three opportunities of shared creation, active participation and supported communication. A problem statement for the project was developed.

How can Idean use sketching in remote workshops so that communication is supported, and participants are actively contributing to the workshop, in order for the outcome of the workshop to be a shared creation between the participants?

1.5 Design Method

The project was executed in three phases. First a research phase, where the opportunity space for the project was explored and defined. Secondly there was an experiment phase, where different solutions were developed and tested. Finally there was a synthesis phase, where the outcomes of the experiments were analyzed and synthesized into the final design outcome.

Research Phase

The research phase consisted of:

1. A review of applicable literature from the fields of visual thinking, creative problem solving, remote collaboration and psychology.
2. Interviews on the topics of Idean's practice, sketching in corporate environments and conducting remote workshops.
3. An observation of a remote workshop within Idean.

Visual thinking literature was reviewed to establish which functions sketching could have in a group collaboration. CPS literature was reviewed to establish a baseline for the structure of workshops. Literature concerning remote collaboration was reviewed in order to establish how a remote collaboration differed from face to face collaboration. Psychology literature was reviewed to establish how the design outcome could lead to a change of behavior within Idean.

Three semi-structured interviews were conducted. The first interview was done with two designers at Idean and was concerned with Idean's practice and their use of workshops. The second interview was done with a sketching expert and was concerned with sketching in corporate environments. The final interview was done with an expert workshop facilitator within Idean and was concerned with conducting remote workshops.

Finally, one observation of a remote workshop at Idean was conducted, to get a first-hand view of the environment in these workshops.

Experiment Phase

The experiment phase was conducted in three sprints, each of which focused on developing one part of the design outcome.

The first sprint focused on developing a practical method for sketching in remote workshops. Three different methods were developed and tested. The methods were tested with separate groups, in three 30-minute tests. The groups consisted of Idean employees, in addition to one TU Delft master's student. Two of the groups consisted of three participants, while the last group consisted of two participants. The tests were finished with a short reflection with the participants.

The second sprint was focused on developing sketching activities in workshops. Three existing activities were adapted for use in remote workshops. The activities were tested by 7 master's students from TU Delft. Instructions were sent to the participants, the participants tested the activities at home, and sent the results from the activities in return, in addition to a short written reflection. Two of the activities were tested by two participants and one activity was tested by three participants.

The final sprint was focused on developing the activities further, as well as developing sketching instructional material for the workshop, and lastly to explore how to use the results of the sketching activities. A workshop that was conducted to test the solutions that were developed in this sprint. The workshop lasted 2.5 hours and was conducted with four participants, two Idean employees, and two employees of affiliated companies. The workshop ended with a 30 minute reflection with the participants.

Because of the short time between development and testing, it was challenging to find participants for the tests. This was the reason for the inconsistency in the number of participants in the tests, as well as the reason why all participants were not Idean employees.

The reason for dividing the experiment phase into separate sprints was because of the perceived complexity of the problem that was

faced. In order for the design outcome of this project to be able to have a substantial influence on the workshops at Idean, the CPS process had to be taken into consideration, in addition to considering visual thinking, remote collaboration and psychology. This meant that there were many different parts from these three fields that would be interconnected and had to fit together. Many different interconnected solutions had to be developed, so that sketching could play a substantial role throughout several parts of the workshops and therefore it was decided that the solution would be developed through several sprints.

Sprints have the ability to build up a system piece by piece, securing value along the way and making sure that any new addition to the system is compatible with the rest of the system. In this way, the uncertainty of working with a complex system was managed by securing value along the way and ensuring that the project could be scaled and developed further, even after it was handed over to Idean.

Synthesis Phase

The results of the tests were analyzed based on the observations from the tests as well as the comments from the participants. The design outcome was built piece by piece through the three sprints. However, the different solutions that were developed were reviewed and altered in the synthesis phase, based on the insights from all three tests. The solutions that were developed were compiled into a toolkit using sketching in remote collaboration. In addition to this, an implementation plan was made for how Idean could develop the toolkit and their visual thinking practices further.

Report structure

The report will first cover the research that was done, to establish the context that the toolkit is designed for, and which considerations it had to take into account. Secondly, in the experiments section, the three sprints and the accompanying tests will be described. In the results section, the results from the tests will be presented. In the discussion chapter, the results will be discussed, the final toolkit will be presented and its relation to the research that was done will be discussed. In addition to this, an implementation plan for the toolkit and how Idean can develop their visual thinking practices will be presented. Finally, the conclusion chapter will summarize the main value of the toolkit and how it answers the problem statement.

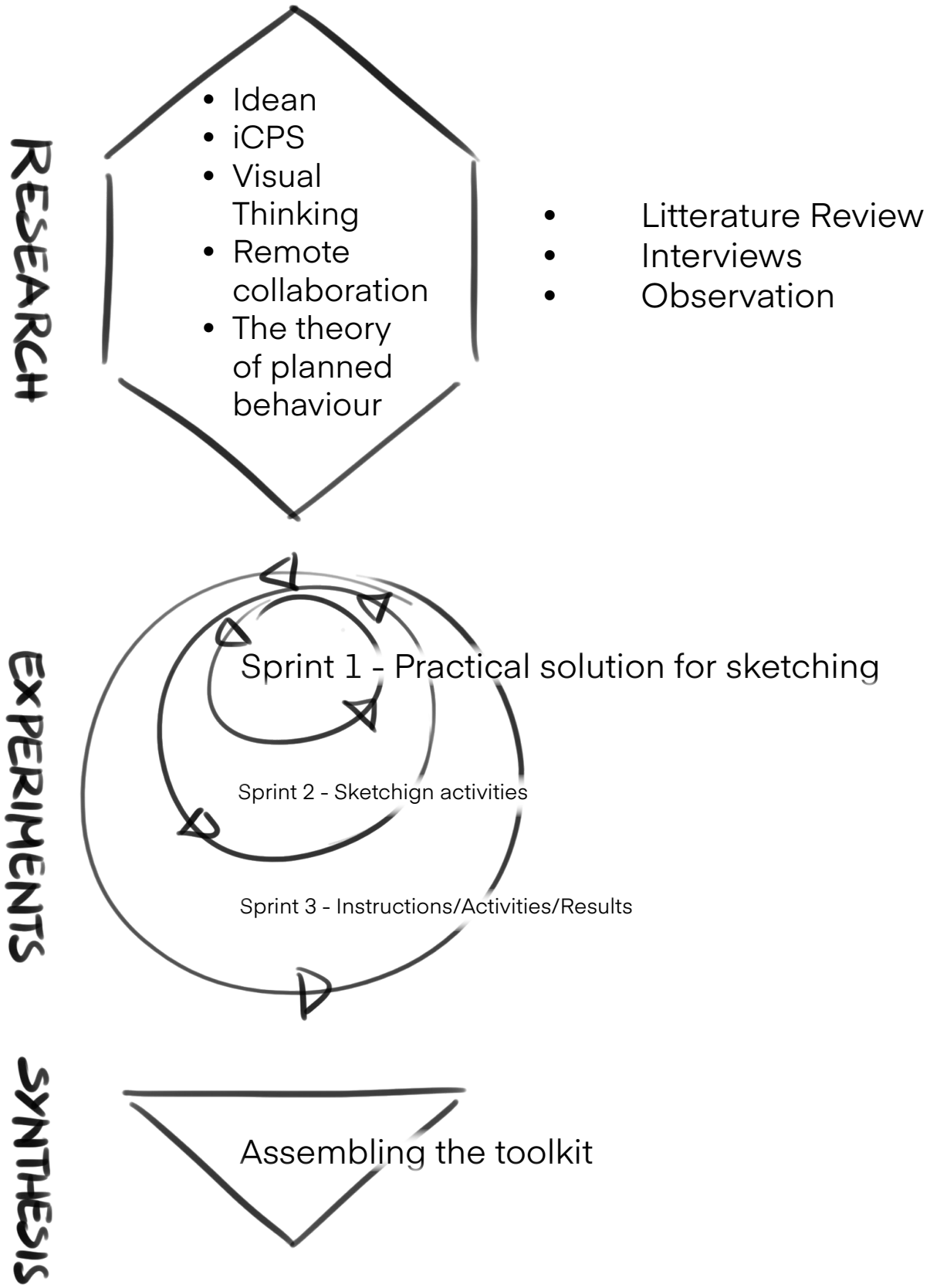


Figure 11. Design method

1.6 What is Being Designed

The design outcome of this project was a toolkit for sketching in remote workshops. Similar to the reason for using a sprint method for building the design outcome, it was decided that the design outcome would be a toolkit. This was because of the substantial influence that the design outcome was desired to have on Idean's workshops. If the solution was to take into consideration CPS, visual thinking, remote collaboration and the psychology, a toolkit with many interconnected solutions was seen as the most promising design outcome.

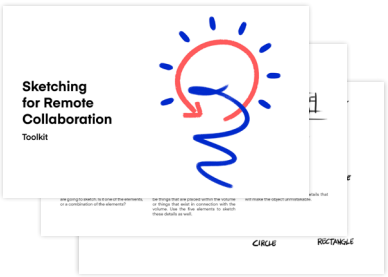


Figure 12. Sketching for remote collaboration toolkit

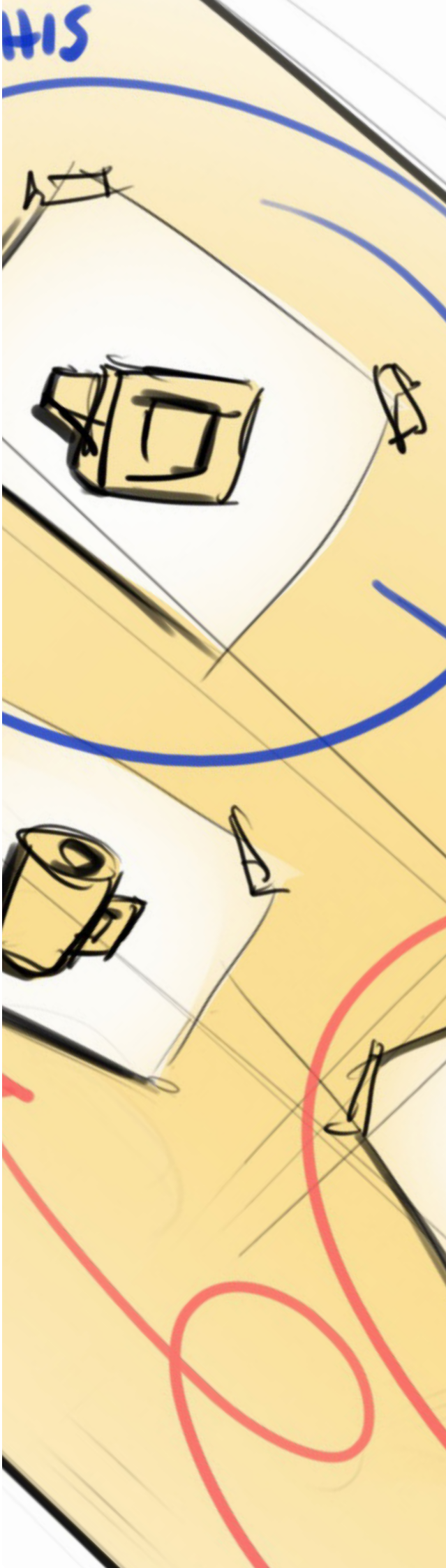
The final toolkit can be seen in Appendix B.

This toolkit is designed with the intention that it should be a foundation that can be developed further after it is handed over to Idean. This means that instead of the toolkit having one element that is developed extensively, it will have several elements that have gone through some development but can be refined and expanded further once it starts being used in practice. This approach was taken to make sure that all the elements that were needed to use sketches in remote workshops were in place when the toolkit was handed over, and Idean could start sketching in remote workshops straight away.

The content of the toolkit is:

- Sketching instructions.
- A practical method for making and sharing sketches in a remote setting.
- Creative activities centered around sketching that can be done in remote workshops.
- A visual reasoning canvas that is used to capture the value generated in the activities.
- Guidelines for preparing the activities

2 Research



Now that we know that the design outcome will be a toolkit for sketching in remote workshops, we can look into the different fields of research to see which considerations and elements the toolkit had to take into account.

2.1 Benefits of Sketching

First of all, it must be established how sketching influences a group collaboration to know which benefits could be achieved by using sketching in remote workshops, and thereby which benefits the toolkit could provide. How does collaborating around sketches differ from verbal communication and what effects does sketching have on the group work and on the individual?

Tangible Thinking

The main function that sketching has, that is not present in verbal techniques, is that it makes thoughts more tangible. Sketches can communicate both concrete and abstract concepts. Concrete concepts can be represented as a direct depiction of the concept, while an abstract concept can be represented through a metaphorical representation of the concept. Sketches are a more concrete medium, while verbal communication is a more abstract medium. This means that sketches are easier to understand than verbal communication, no matter whether the sketch depicts a concrete or abstract concept (Tversky, 2002).

Figure 13. Tangiable thinking

Shared Understanding

In a group context, making thoughts more tangible through sketches helps create a shared understanding regarding different concepts. By using sketches, the group gets a shared visual context. In a case study on actively using sketching to aid the design process, Craft & Cairns (2006) observed several examples of how sketches enabled a shared understanding within the team. Sketches helped the participants in explaining difficult concepts; sketches were used to confirm that other participants understood the discussion; and through sketching out alternatives, the group could collaboratively argue and decide on the best option. In all three examples, the sketches helped participants understand expert knowledge of one of the other participants. This meant that everyone could follow the discussion and participate in the collaboration.

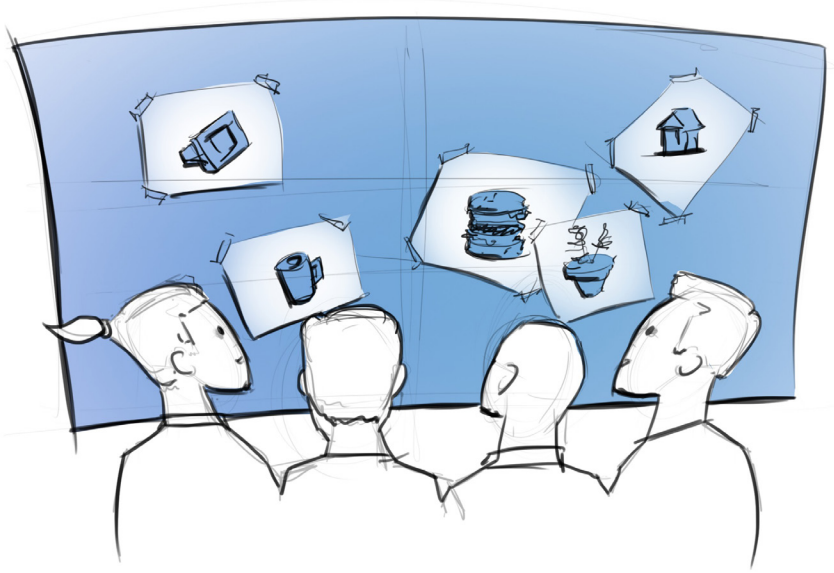


Figure 14. Shared understanding

Shared Creation

The shared understanding that is created through sketches, means that everyone in the group can participate actively in the collaboration. Shared sketches help the participants create a shared focus and common ground. In addition to this, their collaboration becomes more continuous than a collaboration without a shared sketch (Heiser et al., 2004). As a result of the shared understanding that is created, participants are enabled to create ideas together by building on each other's input (Craft & Cairns, 2006). Craft & Cairns (2006) found that the participants in their case study used the ideas that were previously recorded in sketches as components,

for building more complex ideas later on. Heiser et al. (2004) similarly reported that by working on a shared sketch, the result of the collaboration did not belong to one of the participants more than the other, but that it was a joint product of their collaboration.

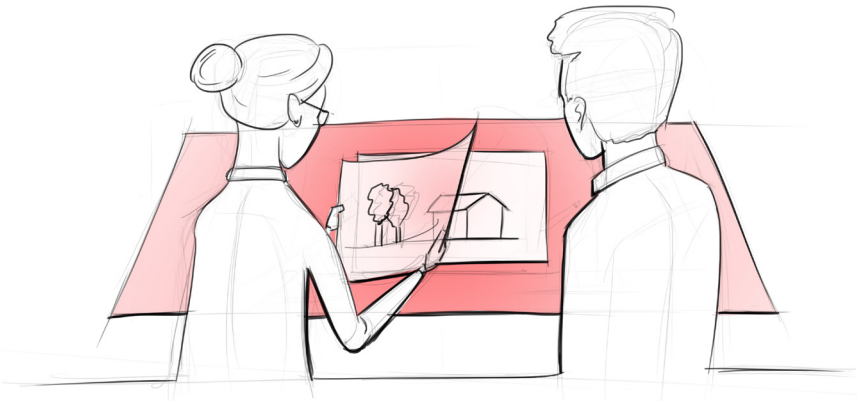


Figure 15. Shared creation

Recording Thought and Aiding Memory

Another function of using sketches is that it creates a record of the thought process and the teams decisions, that can be used to guide further discussion (Craft & Cairns, 2006). This record does not rely on unreliable human memory (Tversky, 2002), and can be used to accurately retrieve information for later use. For example, the participants in the case study of Craft & Cairns (2006) would retrieve sketches that were drawn earlier, to explain new concepts and ideas.

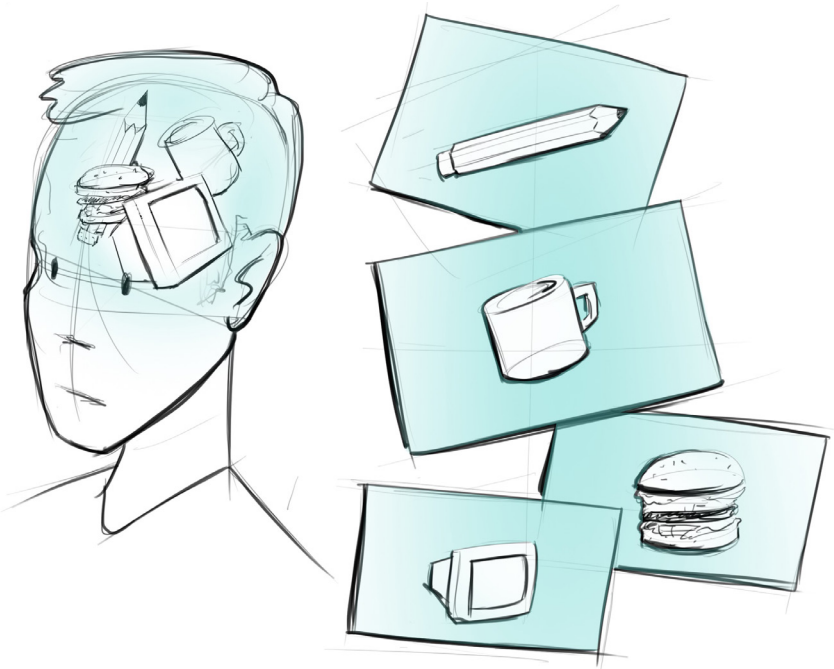


Figure 16. Record of thought

Patterns and Relationships

With sketches it becomes easier to see patterns and relationships between parts of the sketch or in-between sketches. Tohidi et al. (2006) found that patterns and relationships emerged when they looked at a collection of sketches from a user testing study, when the sketchers were spread out so they could see them all at the same time. These patterns and relationships then gave insights about their research that they did not anticipate and therefore had not asked the users about. In this study, they similarly found that when the participants were sketching their ideas, they were able to discover new features and relationships between the elements that they were sketching. They found new ideas and refined the ideas that they had verbalized earlier. As a result of this, the participants also gave more reflective feedback with thoughts and ideas, instead of reactive feedback such as criticism or appraisal.

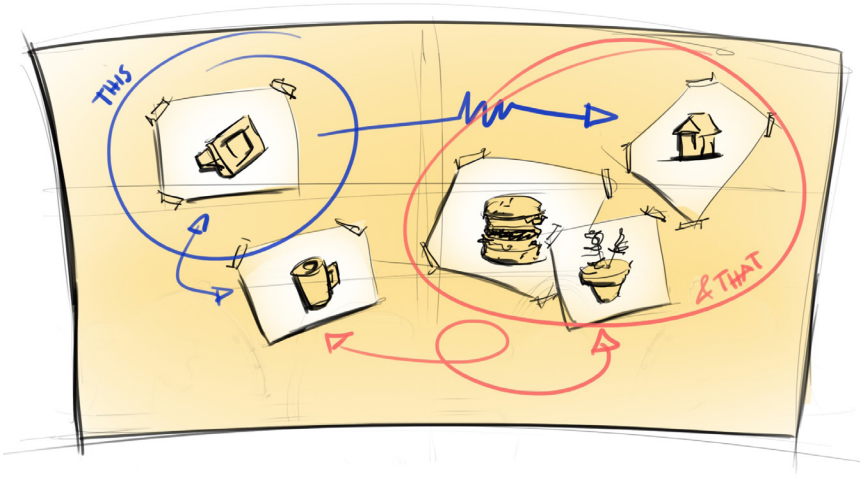


Figure 17. Patterns and realtionsips

With this we see that the benefits that sketching could bring to a group collaboration are:

1. Making thoughts tangible.
2. Creating a shared understanding for the concepts and ideas discussed.
3. Enabling shared creation between the group members.
4. Recording thoughts and aiding memory.
5. Uncovering patterns and relationships between different pieces of information.

These benefits are thereby what the toolkit should strive to achieve in the remote workshops.

2.2 Drawbacks of Sketching

Despite these promising benefits of sketching, introducing sketching into a collaboration doesn't come without drawbacks. In order for the toolkit to be successful, these drawbacks need to be known, so that they can be mitigated in the toolkit.

Attention

In group collaboration, making sketches takes more time then verbal communication and diverts the attention of the individual away from the group collaboration and to the action of sketching. Van Der Lugt (2001) found that in idea generation workshops, activities that required participants to sketch, made it difficult for the participants to be fully involved in the group process. The attention and time it took to make sketches of their ideas resulted in the individual losing connection with the group process while sketching their ideas. This was because, while the individual was focusing on sketching an idea, the rest of the group came up with several new ideas, and when the attention of the individual came back to the group, there was a lot of information that the individual had missed.

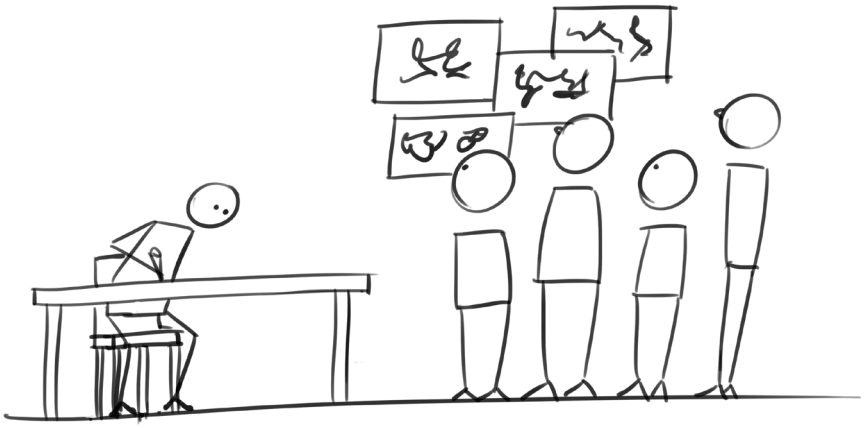


Figure 18. Attention

Judgment

Van Der Lugt (2001) also proposes that *"sketching requires a certain level of commitment to an idea"* before it is sketched. This means that the individuals judge the ideas in terms of if they are worth sketching or not before they actually sketch them. In CPS, the main line of reasoning is *"getting many ideas with a view to implementing one or two good ideas"* (Buijs & van der Meer, 2013). Holding back ideas and not sharing them through sketches would therefore be destructive to the CPS process.

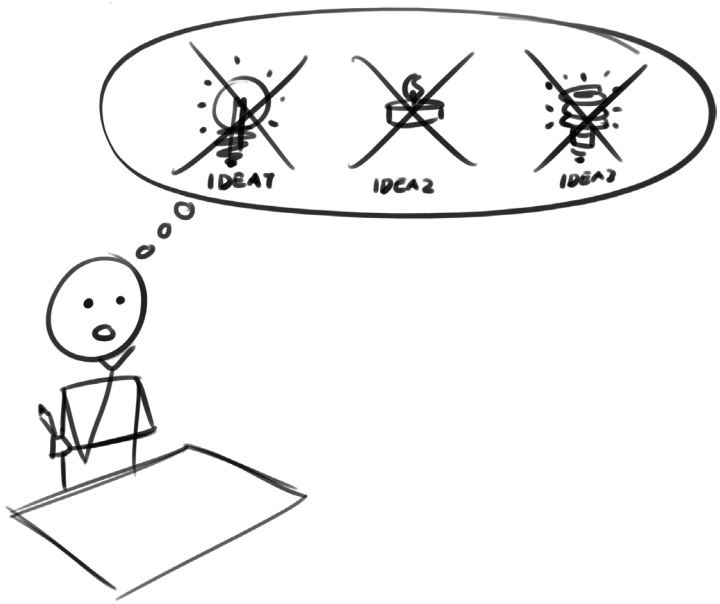


Figure 19. Judgement

Hesitation to Sketch

Lastly sketching (or drawing) is also influenced by cultural judgements of what a drawing should be. In western cultures, according to Neil Cohn (2014), drawing brings with it several assumptions that drawing is about aesthetics and personal expression. These assumptions restrict people from developing drawing ability. This means that most people in western cultures don't develop their drawing abilities in their youth, and therefore have an attitude of "I can't draw" as an adult.

Figure 20. Hesitation to sketch

These three drawbacks had to be accounted for and mitigated in the toolkit in the following ways:

1. It had to be defined when the attention should be on sketching and when it should be on the group collaboration.
2. It had to be defined how to work around the judgement that came with the activity of sketching.
3. Actions had to be taken to relieve the hesitation to sketch.

2.3 Making Meaningful Sketches

Now that we know what the potential benefits and drawbacks of sketching are, we have to look into what is useful and meaningful to sketch in Idean's workshops. An interview was conducted with Hanne Wetland, to gain insights on how to make meaningful sketches in workshops and in a corporate environment as a whole.

Hanne Wetland is a Norwegian designer and expert in using sketches in a corporate environment. She works for the consultancy Knowit, where she teaches sketching to her co-workers and clients, in addition to using it herself when consulting with clients on circular economy.

Hanne Wetland has chosen to call the type of sketches that she uses in her work *Nyttetegning*. When translated from Norwegian, this means functional drawing. What she means by this is that the purpose of this type of sketching is to get one single point across to the "reader" of the sketch. In practice, this means that the sketch should only be rendered to the level where the point that is being made is communicated to the audience. The purpose of doing it in this way is so that the sketches are as efficient as possible and so that this type of sketching becomes approachable for everyone to use.

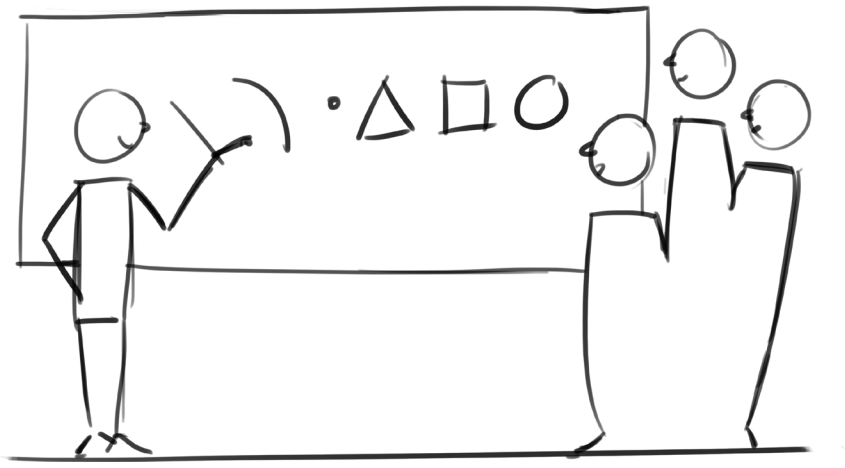


Figure 21. "Nyttetegning" - Functional drawing

Hanne says that before she meets a new client in a new domain, she has to prepare her sketching skills for that specific domain. She prepares by looking up what things are relevant to sketch in a specific domain, and practises sketching these things, in simple icons, so that she knows that she has these sketches stored in her brain for when she will need them.

Elaborating further on what to sketch, she emphasizes that the most meaningful way to use this type of sketching is by sketching situations involving people. The icons themselves are not meaningful, it is when you combine icons and simple sketches so that they illustrate a situation, that it can bring value to a conversation. She points out that once you start to include people in the sketches, the focus also becomes user-centred. Working a lot with digital solutions, she also says that there are other tools that are better at sketching out things with higher fidelity, such as the steps you should go through in a user interface. However, sketching is very useful to visualize the meta level situation that the user is in.

The main points from the interview that gave an insight about how to make meaningful to sketches in workshops were:

1. The main purpose of the sketch is to get one point across to the audience and the sketch should only be rendering to the degree where this is achieved.
2. Different things are relevant to sketch in different domains. Therefore an awareness of the things that are relevant to sketch in a specific domain is needed.
3. Sketching situations involving people is a meaningful way to use sketches in a collaboration, as this makes the conversation more user-centred.

Beyond these insights there are possibly numerous other ways to make meaningful sketches in workshops. However, the insights were seen as a reliable starting point, as the context where the insights originated was comparable to the context that Idean works within.

2.4 Integrated Creative Problem Solving

As mentioned in the introduction, the CPS methodology was used to establish a baseline for the structure of workshops. As we will see there are many different aspects to the CPS method. The toolkit had to be compatible with these different aspects in order to capture the value of the CPS method and build on it.

The theory of *Integrated Creative Problem Solving* (iCPS), developed by Buijs & van der Meer (2013), provides a framework that explains how to set up a workshop that follows a creative process. Although Idean might not strictly follow the iCPS theory, the structure of their workshops was similar to the iCPS structure, and the theory is therefore also applicable to their workshops.

The field of Creative Problem Solving (CPS) has largely developed in the United States, at Buffalo State University (Heijne & van der Meer, 2019). In the Buffalo school of CPS, you follow a linear process of fact finding, problem finding, idea finding, solution finding and acceptance finding, in order to solve a problem creatively. Buijs et al. (2009) proposed that this linear CPS model was insufficient as it didn't reflect how innovation projects were conducted. They instead argued for a nonlinear process that took into account the outside processes that also influenced the solutions that were generated and that were in line with the corporate process. This later developed into the Integrated Creative Problem Solving Process (iCPS).

The iCPS process was introduced by Buijs and van der Meer in their book *Integrated Creative Problem Solving*, in 2013, and further elaborated on in the book *Road Map for Creative Problem Solving Techniques* by Heijne and van der Meer in 2019. The following overview of the iCPS process is taken mainly from the book by *Road Map for Creative Problem Solving Techniques* (Heijne & van der Meer, 2019).

Integrated Creative Problem Solving is a systematic way of creatively solving open problems in a group session. in this report these sessions will be referred to as workshops. In these group workshops you go through a process of problem finding, idea finding and solution finding which will lead the group to a solution for the problem at hand.

iCPS Sub Processes

Within iCPS there are four sub-processes at work: *project management, information finding, acceptance finding and content finding*.

Figure 22. The four sub processes of iCPS

Project management is mainly about managing all the practical aspects of organizing and conducting a workshop. The information finding process is about finding the information that is needed as input in the other sub-processes. Acceptance finding is about making sure that the solutions that are generated in the workshop are implemented after the workshop. Finally, content finding is the process that the group goes through in order to creatively solve the problem at hand. It is within the content finding process that the actual workshop takes place.

Roles

The people involved in the workshop will generally have one of three roles, *problem owner, facilitator or participant*. The problem owner is the person who initiates the workshop by having a problem that needs to be solved. The facilitator is responsible for planning and executing the workshop and the participants are the group of people that are present in the workshop and collectively solve the problem (Heijne & van der Meer, 2019).

Workshop Procedure

In the workshop, the facilitator guides the participants through three stages, namely problem finding, idea finding and solution finding. In the problem finding stage, the participants explore and redefine the problem that is given by the problem owner. In the idea finding stage, the participants come up with ideas for the problem that was developed in the problem finding stage. And in the solution finding stage, the participants develop the ideas into solutions that would be feasible in the real world.

Figure 23. The three stages of an iCPS workshop'

The three stages of the workshop can further be divided into three steps - diverging, reverging and converging. These three steps are repeated in each of the three stages of the workshop. In the diverging step, the participants open up and come up with as many options as possible. (Options is the word that is used to describe what the participants generate in the different stages of the workshop.) In the reverging step, the participants get an overview of the generated options. And in the converging step participants select the most promising options to further work with, in the next stage of the workshop.

With this we see that the toolkit has to take three questions into consideration:

1. Which sub processes of iCPS should it influence?
2. Which stages of the workshop should it influence?

These questions had to be considered to make sure that the toolkit was aligned with the iCPS process and aware of which parts of the process the toolkit was influencing.

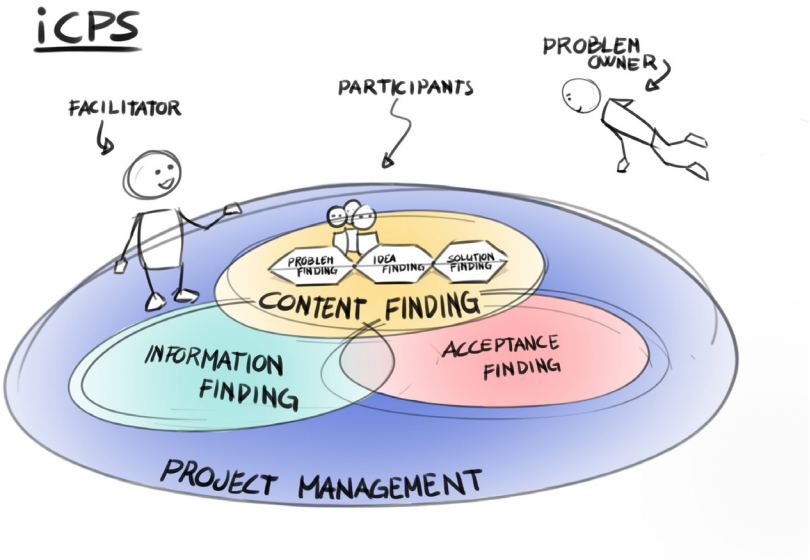


Figure 24. The iCPS process consists of different prosesses, roles and stages

2.5 Remote Collaboration

This project was focused on remote workshops. Because of this we have to look into remote collaboration to see how it differs from face to face collaboration and which considerations had to be made when working in a remote context.

Van der Kleij et al. (2009) investigated how conversations changed in face to face versus remote (video conferencing) meetings. Their main findings were that the conversation in the face to face condition was more informal with participation taking more turns talking and interrupting each other more. In the remote condition, the participants had more difficulty regulating the discussion, with fewer turns talking, remote condition was lower than in the face to face condition, although the performance of each team was the same. the authors argue that the difficulty of regulating the discussion in the remote team, is due to them lacking the full spectrum of communication (verbal and nonverbal).

Siemon et al. (2017) further explains this lack of non-verbal communication in remote collaboration, through media naturalness theory (MNT). MNT explains that communication through a medium suppresses communication because it poses cognitive barriers that human evolution hasn't accounted for. The interplay between verbal and non-verbal communication is challenged when communicating through a medium and does not perform in the same way as in face-to-face collaboration (Siemon et al., 2017). This is a problem for remote collaboration as the information that is conveyed through non-verbal communication becomes limited.

Siemon et al. (2017) also relate remote collaboration to media synchronicity theory (MST). Collaborating through digital media gives the opportunity to communicate in many different channels, compared to a single channel in face-to-face collaborations. MST explains that communication is enhanced if the synchronicity of the medium that is used is matched to the synchronicity that is needed for the task at hand. Synchronicity is defined as a "state in which individuals are working together at the same time with a common focus" (Siemon et al., 2017). Multichannel communication thereby becomes an opportunity for remote collaboration as different channels can be used for different tasks.

With this we see that there are two fundamental differences between face to face and remote collaboration. The first is that the communication becomes more formal in remote collaboration, because of a lack of nonverbal communication that regulates the discussion. The second is that remote collaboration gives the opportunity to communicate through several different channels based on the synchronicity that is needed for the task that is

being performed. These two insights required the toolkit to consider:

1. If it will try to cater to the formal communication or if it will try to create a more informal communication?
2. How it related to the use of different channels and when to work in which channels?

2.6 Observation of Remote Workshop

In order to gain insights into how Idean conducted their remote workshop, a remote workshop that Idean conducted for two of their clients was observed. The purpose of this observation was to get an understanding of Idean's remote workshops, so that the toolkit could be incorporated in their way of working, as well as addressing potential challenges in their remote workshops.

The clients in the workshop were two industry giants. The details of their collaboration can't be disclosed due to confidentiality reasons, but the purpose of the workshop was to explore a potential collaboration between the three companies, centred around developing a go to market strategy for a new technology. The workshop was facilitated by Idean and lasted for 3 hours.

Tools and Space

The workshop was conducted remotely with all participants in separate locations. The communication was done via the videoconferencing tool Microsoft Teams and the digital whiteboard tool Miro. Microsoft Teams was used for audio and video communication. Miro was the digital space where the workshop was conducted and where the activities took place. (An explanation of digital whiteboards like Miro can be found in in Appendix C.

Before the workshop started, the Idean team had prepared the Miro space for the workshop. The space was prepared with a series of canvases which were used for the activities that were conducted throughout the workshop. The canvases structured the activities, by providing specific surfaces that the participants were supposed to work on throughout the workshop. They were prepared with things like a title for the activity, initial problem statement for the activity, guidelines

for executing the activity, and dot votes for each participant to vote on the most promising options at the end of the activity.

The team from Idean had designed the workshop taking into consideration which tools the different activities required. The only functions they had to use throughout the workshop was a function to create sticky notes, a function to edit text on the sticky notes, and the function to place dots on the sticky notes, for voting.

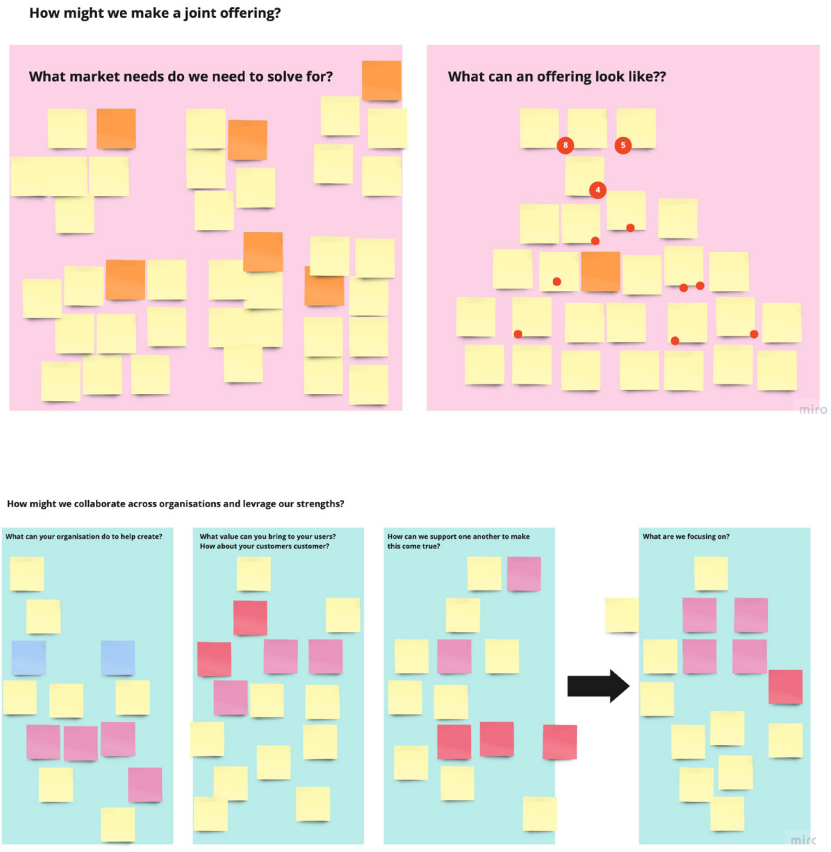


Figure 25. Reconstructed frames from the workshop, the content is taken away because of confidentiality reasons

Workshop Procedure

The workshop was focused on exploring a potential collaboration between the three parties involved. Therefore, the activities that were done in the workshop were focused on reframing the challenge that they wanted to face together, and what each party could bring to the collaboration. The procedure of the workshop was:

1. Introduction of the digital whiteboard tool Miro.
2. Activity where the participants got to test the different tools in Miro.
3. Generation of “How Might We” statements in order to reframe the challenge that the collaboration would focus on.
4. Silent ideation on posits, focusing on solutions for the “How Might We” statements.
5. Mapping of the capabilities that the different parties involved could contribute to the collaboration.

Communication

The clearest difference in the remote workshop, compared to a face to face workshop, was the way the communication was between the facilitators and participants, and between participants. Throughout the workshop, the people from Idean were the ones that did the majority of the verbal communication. The team from Idean was giving instructions and guiding the participants on how to execute the activities, as well as encouraging discussion between the participants. Despite the encouragement from the Idean team, there was very little verbal engagement from the other participants. The only time anything was said by other participants was if they were asked to say something by the team from Idean, or if they asked a technical question about the activity or how to use Miro.

Beyond this verbal communication, there also seemed to be little interplay between the generated options. Since there was very little verbal communication while the participants were generating the options, it is hard to say if they read and took inspiration from the other generated options, while creating new options. When looking at the canvas, it was hard to get a quick overview of the options that were generated. You had to look at and read each participant's sticky notes individually in order to get an overview of the options.

Visualization

In this workshop there was no sketching or other forms of visualization being done during the activities, and all the activities were textual activities. Before the workshop, one person from the Idean team told me that he would usually be standing at a whiteboard making sketches and visualizing during such a workshop, but because it had to be changed to a remote setting, the ability to sketch was also taken away.

From these observations there were several insights that could inform the toolkit.

1. It was clear that preparation of the digital whiteboard before the workshop was essential as it structured the workshop and the activities within it, by providing specific locations where each activity took place.
2. There was a lack of communication between the participants and there seemed to be little evidence that the participants built on each other's ideas.

2.7 Conducting Remote Workshops

Emily Lin, senior service designer at Idean and expert facilitator at Idean was interviewed to get insights on her experience with remote workshops.

She said that conducting remote workshops is a new format which is both unfamiliar for them and their clients. This new format requires them to onboard the participants to the tools that they use in remote workshops, as these are usually unfamiliar to the clients. When planning the workshop, she starts with the goal of the workshop, after which she can create canvases where each activity will be executed. Then she can plan the onboarding based on which functions the activities require.

Commenting on the difficulty of the workshop she said that she had to balance the activities of the workshop between being technically possible to execute by the participants, while still producing a valuable outcome from the workshop. In addition to this, she also tries to take a more pedagogical approach in remote workshops, with more detailed instruction and by checking in more with the participants to hear that the instructions have been understood.

Reflecting on the communication within the workshop, Emily Lin says that because the verbal communication in the workshop is harder and many people can't speak at the same time, they focused on individual ideation activities in this workshop. In this way, they could purposely restrict the inputs that were given by the participants so that the right information was shared at the right moment.

From the interview the insights that were gained were:

1. Because most people are unfamiliar with remote workshops, a thorough introduction to the tools as well as the activities is needed.
2. The activities have to be simple enough for the participants to follow them, but at the same time create a valuable outcome for the workshop.
3. The activities have to be structured so that the right information is communicated from the participants at the right time, since the communication is especially fragile.

2.8 The Theory of Planned Behaviour

Sketching and visualisation was not used in the workshops and there was no defined practice for how to use sketching in these remote situations. Therefore, there needed to be a change of behaviour for the designers at Idean to start using sketching in their remote workshops. The toolkit therefore had to take behavioural change into account to ensure that it would be adopted and used by the designers at Idean. *The Theory of Planned Behavior* was used to ensure that the toolkit took these considerations into account.

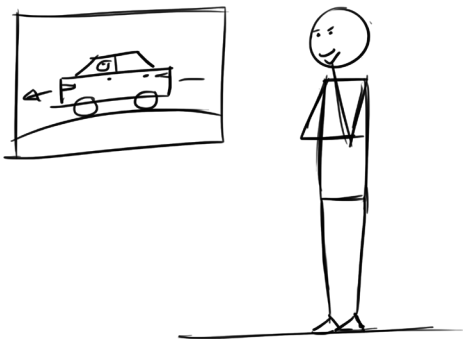


Figure 26. Attitude towards sketching

The theory of planned behaviour is a conceptual framework for predicting human social behaviour, developed by Ajzen (1991). The theory explains that behaviour can be predicted by the intentions to perform the behaviour, which in turn is mediated by the following three factors - attitude towards the behaviour, subjective norms towards the behaviour and perceived control over the behaviour.

The attitude towards the behaviour is a person's favourable or unfavourable evaluation of the behaviour in question. This evaluation is largely formed by the consequences of the behaviour, and if the behaviour has favourable or unfavourable consequences for the individual.

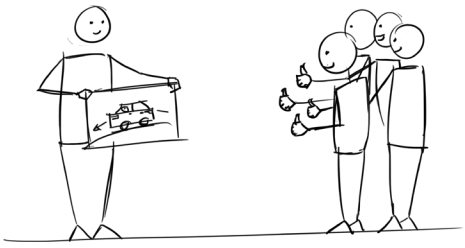


Figure 27. Norms towards sketching

The subjective norms about the behaviour is related to the social pressure there is to perform or avert from the behaviour. The perceived norms of important referent individuals, such as family, friends or colleagues, is most influential when it comes to this factor.

Finally perceived behavioural control is concerned with the perception of the ease or difficulty of performing a given behaviour. This can be related to the level that a person perceives that they can perform a given behaviour at. However, it can also be related to the resources required to perform the behaviour or the opportunities to perform the behaviour.

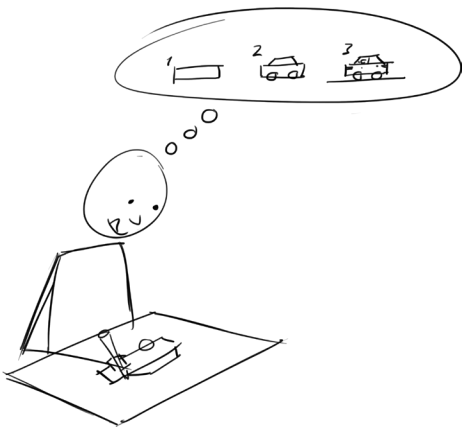


Figure 28. Control over sketching

According to Ajzen (1991) if the attitude towards the behaviour is positive, the subjective norms towards the behaviour are

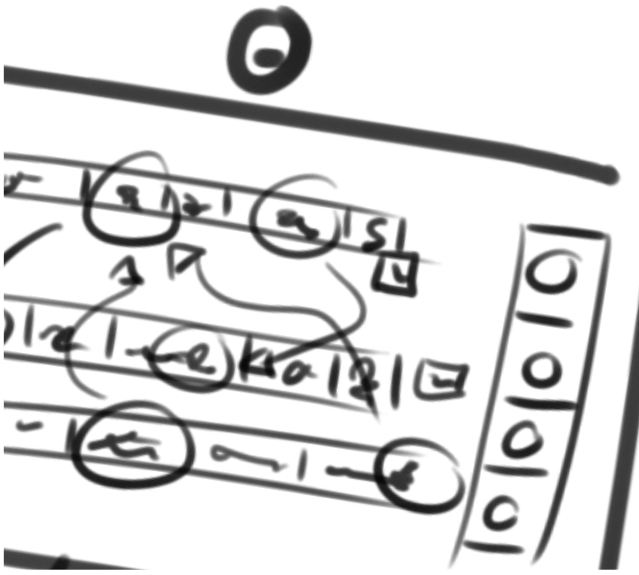
positive and the perceived behavioural control is high, then the likelihood that the behaviour will take place is also high. Ajzen also says that one of the three factors can be more dominant than others when it comes to certain behaviour, but that the three factors are a way of looking at and revealing different sides of the behaviour.

The toolkit had to take these three factors into account. The three factors provide different approaches for tackling the behavioural change. The behaviour in focus was of course sketching, and the three factors can therefore be presented as attitude towards sketching, subjective norms towards sketching and perceived control over sketching.

The toolkit had to take into consideration how the knowledge of these three factors would be used so that the toolkit would influence the designers at Idean to start using sketching in remote workshops. To do this, two questions had to be answered:

1. Which factors will be used to achieve the behavioral change?
2. How will the toolkit influence the factor(s), so that the behavioral change happens?

3 Experiments



From the research it was evident that there were many practical considerations that had to be taken into account for sketching to be included in remote workshops. This was both concerning how the sketched would be made and shared in the workshop, but also regarding the participants willingness to sketch and how to include sketching in the workshop to create the best opportunity for the benefits of sketching to be utilized. Therefore, the experiments were focused towards solving the practical aspects of using sketching in remote workshop. This means that the main focus of the experiments was to creat the conditions for the benefits of sketching to appear, and that the degree to which these benefits occurred had a secondary focus.

3.1 Sketching Method

The first part of the toolkit that was developed was the practical solution for generating and collaborating around sketches in a remote setting. This was a natural place to start building the toolkit, as it was the most fundamental issue. Without a way of generating and sharing sketches there wouldn't be any way to collaborate around them, and none of the benefits of sketching could be made use of.

In developing solutions for remote sketching, three ways of sketching when collaborating remotely in a digital whiteboard were found. The first option is to sketch physically with pen and paper and make the sketches digital by photographing them and uploading them to the digital whiteboard. The second option is to sketch directly in the digital whiteboard, using a digital drawing tablet. Finally, the third option is to sketch in a more experimental way, by using the resources of the internet to find visual material, such as images and icons, that can be combined into a "sketch". This option would be similar to collage making.

Three methods for sketching in remote workshops were developed and tested. The first option for sketching (analogue) was developed into two methods and the third option for sketching (experimental) was developed into the third method. The second option for sketching (drawing tablet) was discarded, as it was thought that that the access to digital drawing tablets would be too rare and too unfamiliar to participants, and thereby not be a viable option in remote workshops.

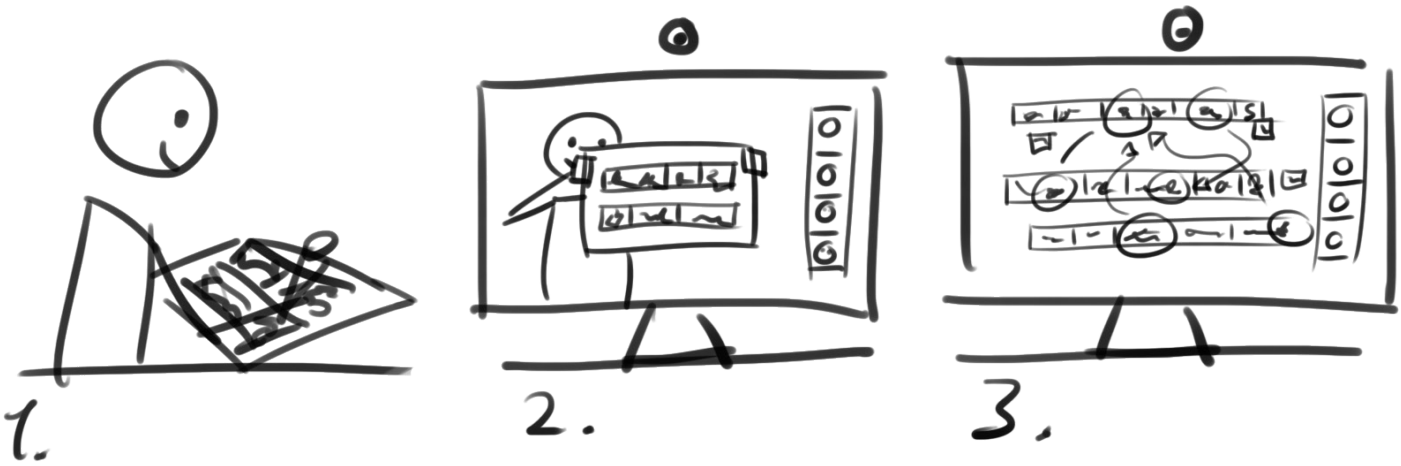


Figure 29. Method 1. Analouge first sketching

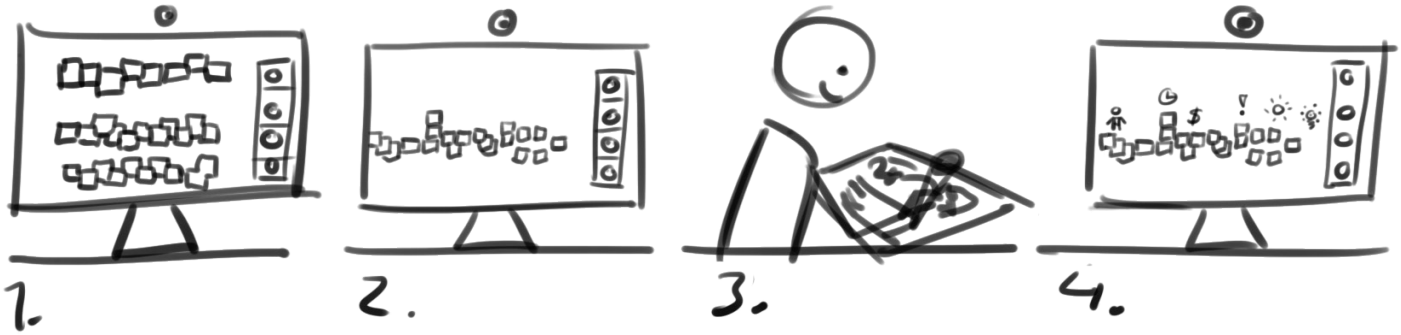


Figure 30. Method 2. Digital first sketching

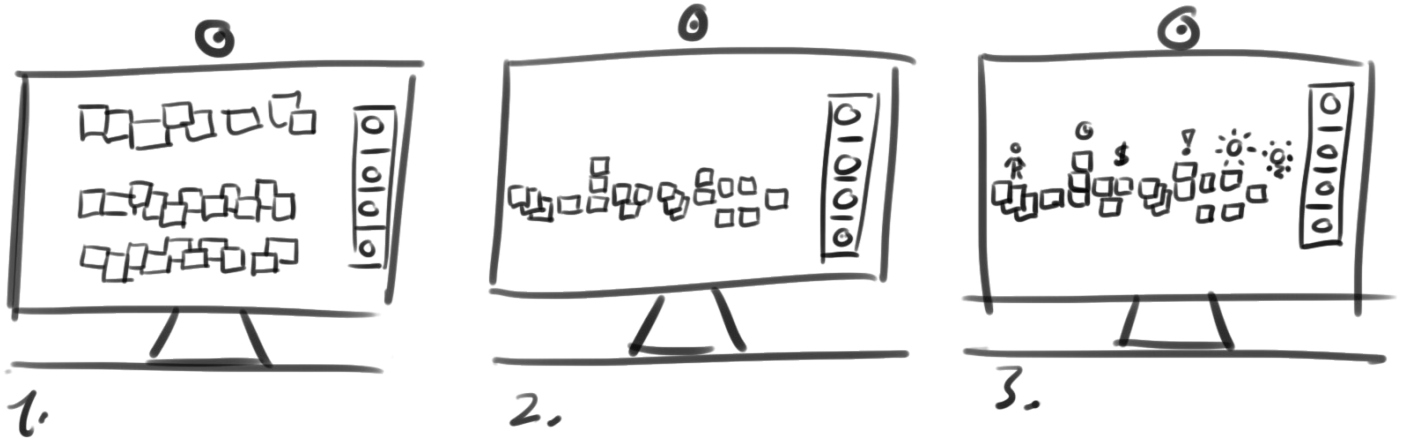


Figure 31. Method 3. Icon sketching

The methods that were developed were:

- **Method 1. Analogue first sketching –** where the participants first made their sketches individually, after which they were photographed and uploaded to the digital whiteboard, and finally collaborated around with the entire group.
- **Method 2. Digital First Sketching** – where the participants first collaborate textually in the digital whiteboard and then emphasize their insights generated by making sketches individually and placing them within the digital whiteboard.
- **Method 3**. Icon Sketching - where the participants first collaborate textually in the digital whiteboard and then emphasize their insights generated by placing Icons within the digital whiteboard.

For testing the methods, the participants needed some kind of assignment to work on. The "How to Draw Toast" activity developed by Tom Wujec (2013) was chosen as a suitable assignment. The "How to Draw Toast" activity is essentially a journey mapping activity. It asks people to draw the steps for making toast, individually on sticky notes, after which the group combines the steps that they have drawn into an integrated model that shows the different aspects of making toast. This activity was chosen as a basis for the tests of the methods, as it was proven to be easy enough for most people to draw, thereby testing the methods for using sketches and not the sketching ability of the participants.

Each method was tested with a separate group and each test took 30 minutes. The first and third group had three participants, while the second group only had two participants due to one participant not showing up to the test. The test was done using the video conferencing tool *Google Meet* and the digital whiteboard tool *Miro*.

The first group tested method 1. Analogue first sketching. Their procedure was to:

1. Individually sketch the process of how to make toast.
2. Show the sketch on the webcam, the facilitator would screenshot the sketch and place it in Miro.
3. Mark similarities and differences between their sketches, using arrows, circles and posits in Miro.

The second group tested method 2. Digital first sketching. Their procedure was to:

1. Individually write down the steps of making toast on sticky notes in Miro.
2. In collaboration, organize the sticky notes into a coherent process that showed the different aspects of making toast.
3. Make sketches that highlight the most important aspects of making toast and add them to the model.

The third group tested method 3. Icon sketching. Their procedure was to:

1. Individually write down the steps of making toast on sticky notes in Miro.
2. In collaboration, organize the sticky notes into a coherent process that showed the different aspects of making toast.
3. Find icons that highlight the most important aspects of making toast and add them to the model.

The limitations of these methods are that they give all of the participants the same roles in the sketching proses, meaning that all the participants get the same task. One direction that could be explored is if participants took different roles in the sketching process. This could be for example based on their ability to sketch or their availability to a digital sketching tablet.

The first method for sketching – analogue first sketching – was chosen as the most valuable option and was thereby the one that was included in the toolkit. Why this was so will be explained in the results and discussion. However, it is important to know that this was the method that was focused on when reading about the development of the rest of the toolkit.

3.2 Sketching Activities

The second part of the toolkit that was developed was activities that could be used for collaborating around sketches in remote workshops.

Several creative activities were found that could potentially be used as sketching activities in remote workshops. These activities either included or could include sketching and could be used according to the *analogue first method*, that had earlier been developed.

From the book *Road Map for Creative Problem Solving Techniques* (Heijne & van der Meer, 2019), the activity *Picture the Problem* was found. From the book *Design Thinking is Dead, Long Live Design Thinking* (Janhagen, 2019) the activity *storyboarding,* was found. The *elevator pitch* activity was adapted from the *Pitch Generator* developed by Viki Pavlic (2019). In addition to these activities, a warmup activity called *Copy journey* was developed.

The activities were all adapted so that they would fit the method for sketching that was previously developed. To fit this method the activities were adapted so that they had:

1. Sketching as the first part of the activity, followed by a collaborative part.
2. A template that could define how the sketches should be structured.
3. Instructions that explained step by step how to execute the activities in a remote context.

The instructions for the activities can be found in Appendix D.

The activities were tested in two stages. First the individual parts of the activities were tested by participants at home. In the first stage, the activities that were tested were:

1. Picture the problem, where the participants explore a problem by making sketches of different parts of the problem.
2. Storyboarding, where the participants develop an idea into a concept, by sketching the problem, the solution and the outcome, after which they present their storyboard to the other participants.
3. Elevator pitch, which is an activity where the participants make a visual that can be used for an elevator pitch by specifying different information about the concept.

The test was conducted by sending the participants instruction material for the activity, and by them doing the activity on their own. Picture the problem was tested by three participants, while storyboarding and elevator pitch was tested by two participants. This tested the understanding of the instructions, the difficulty of the activity and the prepared templates.

Figure 32. The three basic steps of each activity - sketch, upload and collaborate

Based on the results from the first stage of testing, the activity elevator pitch was discarded, and small changes were made to the activities before the second stage of testing.

In the second stage of testing, the test was done within a full workshop, with the activities coming in succession of each other. In addition to the activities that remained from the first stage of testing, the activity *Copy Journey* was developed and tested in the workshop.

Copy journey is an activity where the participants copy a user journey that has been sketched as an example. The participants copy the sketch and alter it where their experience of the journey is different than the example.

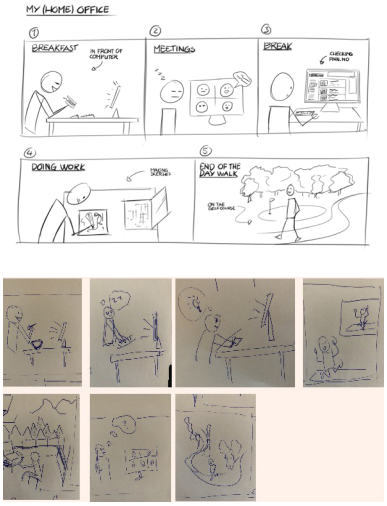


Figure 33. Copy journey example

Both the individual and collaborative part of the activity was tested in the workshop, and the activities were tested in succession of each other. The purpose of this test was to see how the insights from one activity translated into the next, how the collaborative parts of the activities worked.

The workshop was conducted with four participants and lasted 2.5 hours, followed by a 30 minute reflection.

The limitations of the development and testing of this part of the toolkit was that the workshop where the activities were tested, was designed so that all the activities could be included. The workshop went through the three stages of problem finding, idea finding and solution finding, however the three stages were quite condensed, so that the workshop could be finished within the 2.5 hours that the workshop lasted. In addition to this, the activities weren't tested in combination with textual techniques, which could give different results.

3.3 Sketching Cheat Sheet

To help the participants during the sketching activities, a sketching cheat sheet was developed. The cheat sheet built on the visual alphabet (Gray et al., 2010) and showed how to sketch different elements that would be useful for the activities. The cheat sheet covered how to sketch humans, emotions, objects and situations. The purpose of the cheat sheet was for it to be a reference for

the participants throughout the workshop, where they could find inspiration if they became stuck with their sketches.

The cheat sheet was tested in the workshop together with the sketching activities. It was introduced at the start of the workshop and was placed next to each of the activities so that the participants had easy access to it while they were making their sketches.

3.4 Service Model Canvas Visual Reasoning

In addition to the activities and the cheat sheet that were tested in the workshop, there was also an experiment with the *Service Model Canvas* (SMC). SMC is a tool that is developed and used internally at Idean to scope and structure projects. The canvas has several fields where information regarding both user needs and organizational needs related to the project is filled out. The full SMC can be found in Appendix E. A specific request from Idean was to see if the sketching toolkit could be tied in with the SMC in some way. This was because the SMC often plays a central role in Idean's workshops and can often be the outcome of workshops in early stages of the projects.

In the experiment the participants were asked to copy sketches that had been made in the workshop into the SMC. The purpose of the experiment was to see if the sketches that were made in the workshop would fit directly into the SMC and if there was a possibility of making a visual add-on to the SMC.

This part of the workshop was highly experimental, and a limitation with the experiment was that neither the activities that were preceding the experiment nor the initial problem statement of the workshop, were made with the intention of filling out the SMC. Therefore, there were no guarantees that the insights generated in the workshop, visual or textual, was relevant for the SMC.

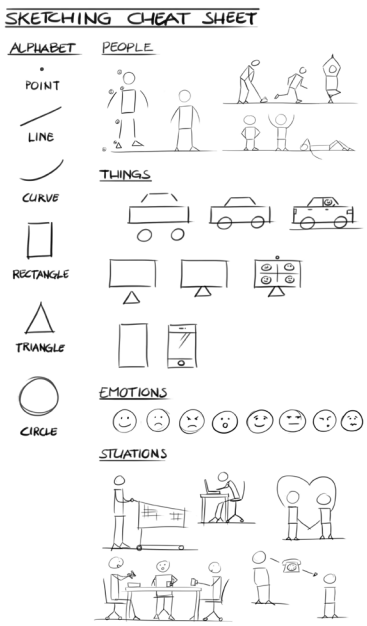


Figure 34. The sketching cheat sheet

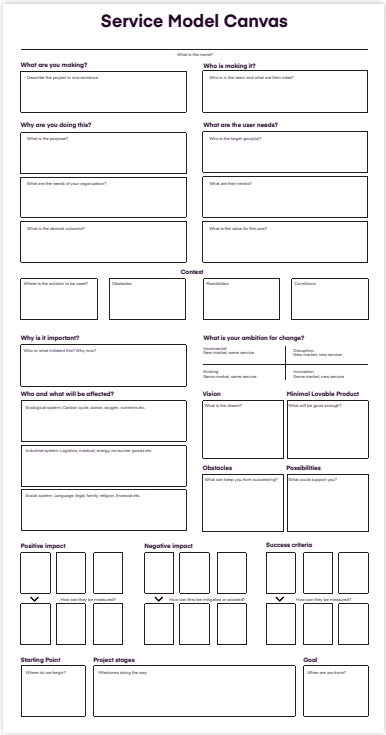
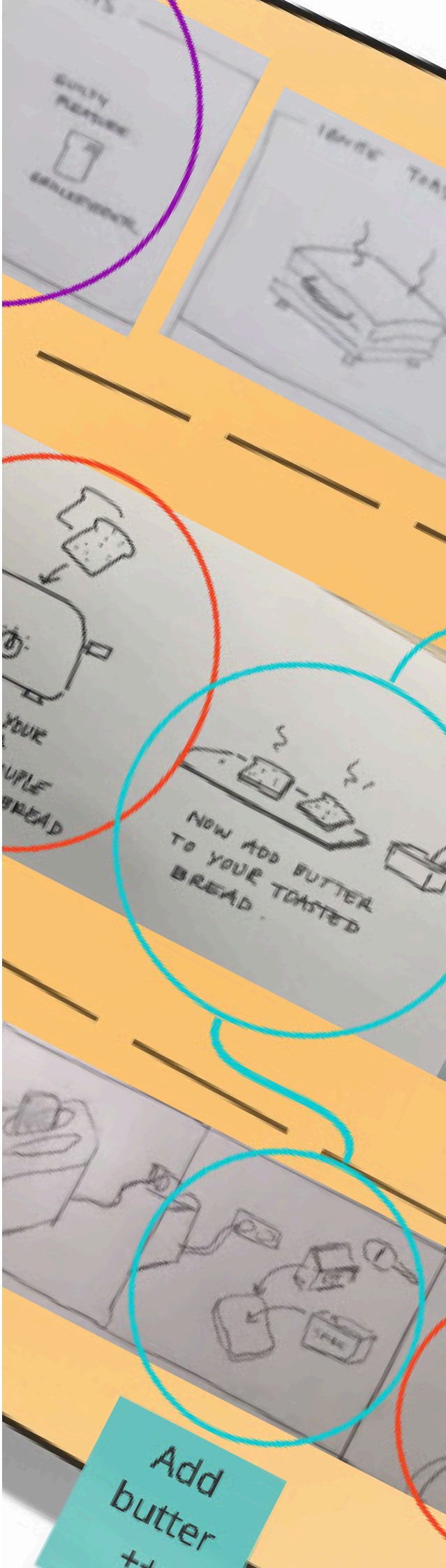


Figure 35. Ideans service model canvas

4 Results



4.1 Sketching Method

The three sketching methods that had been developed were tested with three separate groups. Each group tested one method and each test lasted approximately 30 minutes. The assignment that the groups were faced with was the “How to Draw Toast” activity developed by Tom Wujec (2013). All the groups were able to execute the steps of the method they were testing within the given time.

Method 1. Analogue First Sketching

The steps of the first method were:

1. Individually sketch the process of how to make toast.
2. Show the sketch on the webcam, the facilitator would screenshot the sketch and place it in Miro.
3. Mark similarities and differences between their sketches, using arrows, circles and posits in Miro.

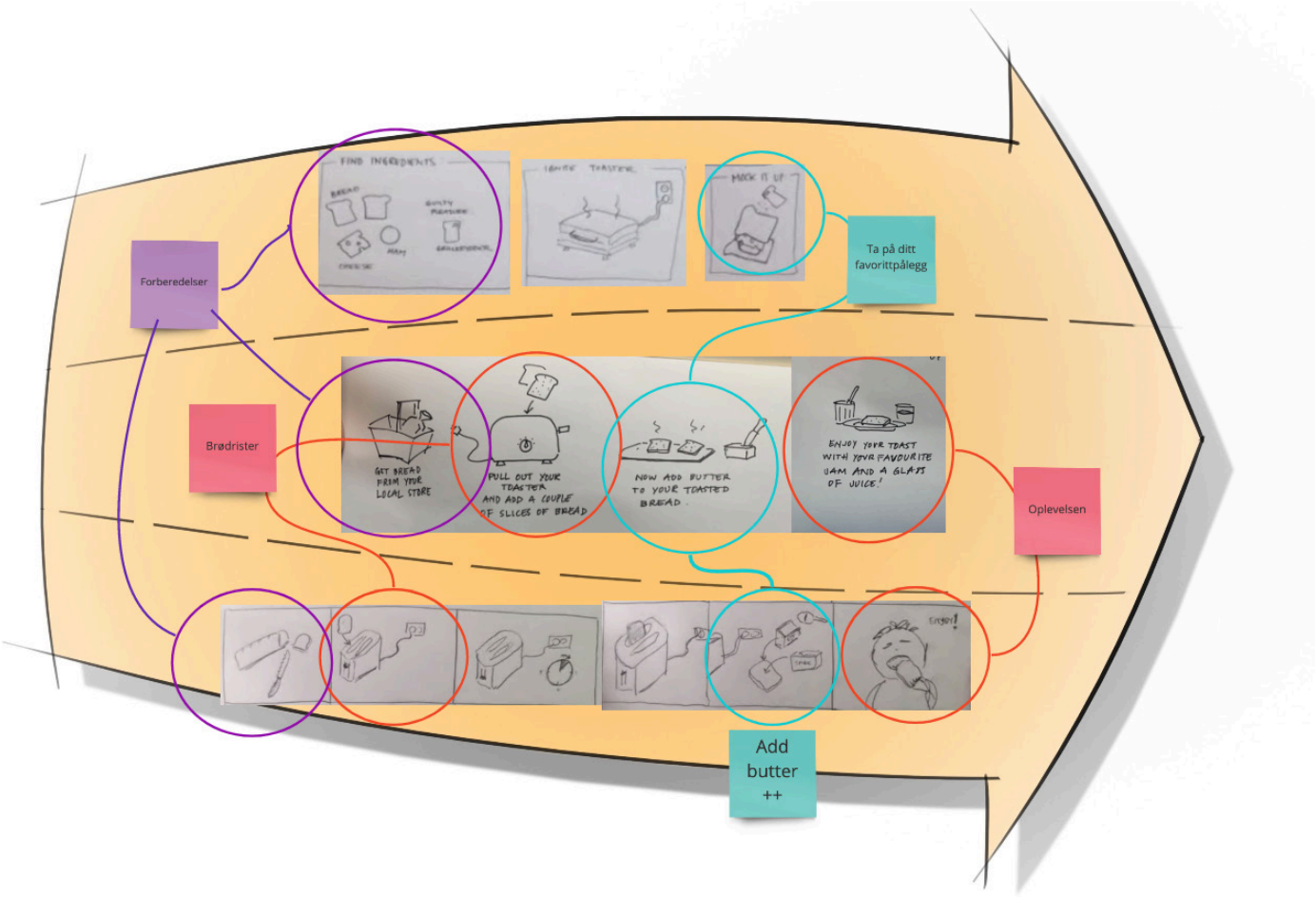


Figure 36. Result from test of analuge first sketching method

The steps were executed by the participants with relative ease. Before starting to sketch, certain participants expressed their low self-esteem regarding sketching, despite this, there were no questions on how to sketch, and the participants executed the step without further questions.

The second step of photographing the sketches through the webcam, worked well for two of the participants. The third participant had a particularly bad internet connection, and the picture that was taken through the webcam was therefore of quite low quality. This led the participant to take a picture with his phone, on his own initiative, and upload it to the digital whiteboard. This was done without difficulty, and the photographs taken with the phone had the highest quality out of all the sketches that were uploaded.

The third step was done with relative ease and with participation from all participants. The participants mainly marked the similarities between their sketches and were able to make connections between most of the sketches. The participants also added colors to their categories, although this was not a part of the instructions. The step was done in collaboration as all the participants contributed with connecting the sketches, however there was little verbal communication between the participants while executing the step.

On a technical level the sketches that were made are seen as clear and easy to read. The line weight of the sketches is thick enough for the sketches to be easy to read, while at the same time being thin enough that the proper level of detail can be included.

The feedback from the participants was that this method for collaborating visually in a remote setting worked well and that it was nice to be able to use an analogue medium although the activity was executed in a digital space. They expressed that using pen and paper made the content have more of a personal touch, because you could see the participants individuality in their sketches. This is assumed to be in contrast to the generic look and feel of something that is produced digitally. Finally, the activity was suggested as a good warm up activity to become familiar with Miro as a tool, because it allowed the participants to test out many different functions, while still working on a meaningful task.

Method 2. Digital First Sketching

The steps of the second method were:

1. Individually write down the steps of making toast on sticky notes in Miro.
2. In collaboration, organize the sticky notes into a coherent process that showed the different aspects of making toast.
3. Make sketches that highlight the most important aspects of making toast, photograph them and add them to the model.

The first and second steps were executed without any problems. The participants individually wrote down their process on sticky notes, after which they collectively discussed and organized them into one coherent model.

In the third step, the participants started by discussing what they needed to sketch and agreed who should make which sketches. Upon starting to sketch, the participants expressed their self-consciousness towards their sketching skills. While sketching the participants were observed throwing away several sketches, because of perceived mistakes that they made. In addition to this, one participant also searched for reference material, to figure out how seatrain objects looked, before they were sketched.

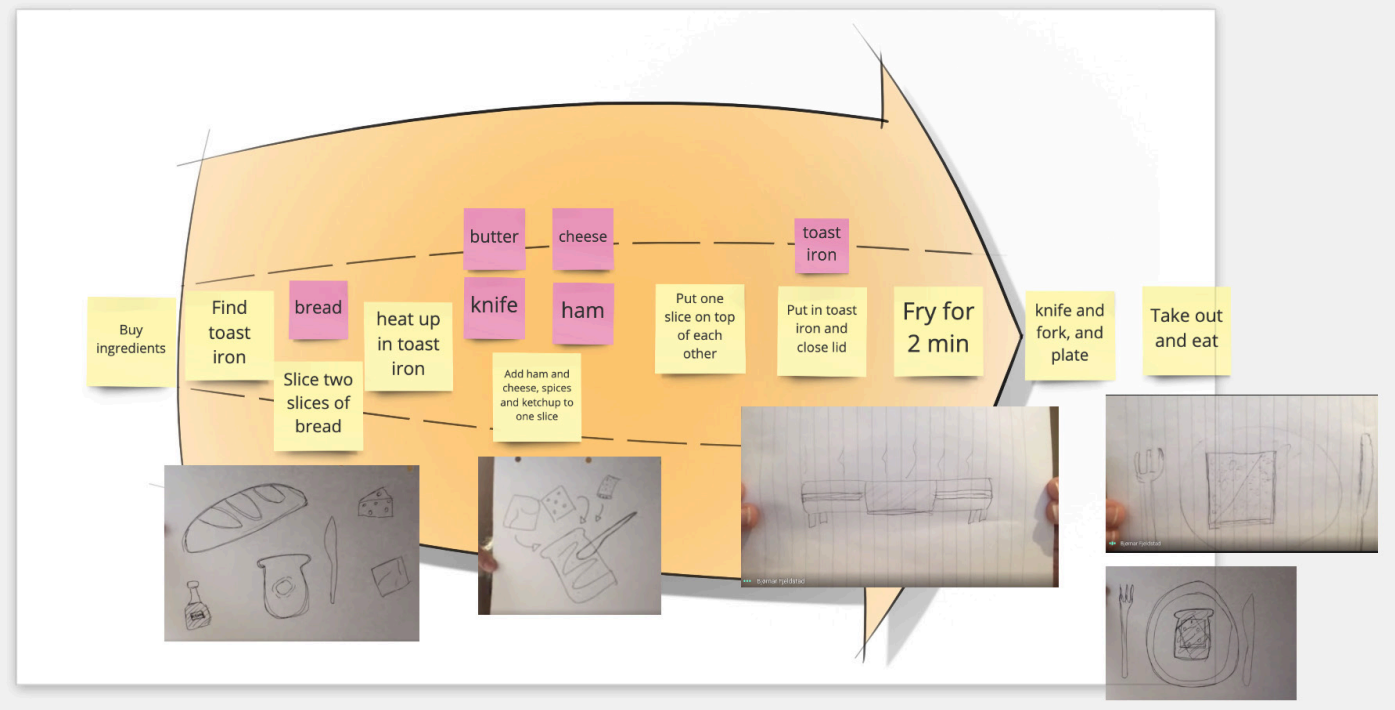


Figure 37. Result from test of digital first sketching method

Once the sketches were made, they were photographed and uploaded to the digital whiteboard, using the webcam as in method 1.

Looking at the result, the sketches outline the basic steps of how to make toast. The sketches tell one story and the same information is found in the sticky notes and in the sketches. On a technical level some of the sketches are hard to read, as the line weight of the sketches is quite thin. This is thought to be because the sketches are made on a large piece of paper with a thin pen and only one sketch is placed on each piece of paper.

The feedback from the participants was that the method worked fine and that they could see more of a story line once the sketches were placed within the model. They also appreciated the fact that having to sketch made them engaged in the process in another way than it would have without having to sketch.

Method 3. Icon Sketching

The steps of the third method were:

1. Individually write down the steps of making toast on sticky notes in Miro.
2. In collaboration, organize the sticky notes into a coherent process that showed the different aspects of making toast.
3. Find icons that highlight the most important aspects of making toast and add them to the model.

The first step was executed without problems. In the second step one of the participants became very passive. The other two participants collectively discussed and organized the posits into one coherent model. The third participant did however follow the discussion and raise his opinion in some points of the process. Through the discussion and organizing of the sticky notes, the participants realized that they had different concepts for what type of toast the process was focused on. Two of the participants had focused on making toast in a toaster, and one had focused on making toast in a toast iron. The participants viewed this as conflicting processes and determined that they had to eliminate one of the alternatives from the model.

The third step was executed relatively easily, and with engagement from all three participants. The participants found relevant icons and placed them within the model. The participants kept notice of

which icons the other participants had already placed in the model and discussed different alternatives for which icons could be placed where.

Looking at the results, the icons that were added to the model told the basic story of how to make toast. The icons made the model into a “tidy” visual that is easy to read. They give an overview of the information that is conveyed in the sticky notes, however the sticky notes also include information that is not shown in the icons.

Reflecting on the use of icons the participants said that icons clearly made it easier to quickly comprehend the information in the model, without having to read each sticky note. However, the participants also expressed that the icons where somewhat limiting and did not show the whole story of the model that they had arrived at. There was also concern about how helpful the icons would be if they were supposed to emphasize more abstract concepts than making toast. In addition to this, using the icons in the end of the process was thought to have missed an opportunity of aiding creativity, which could have been the case if the icons had been used earlier in the process.

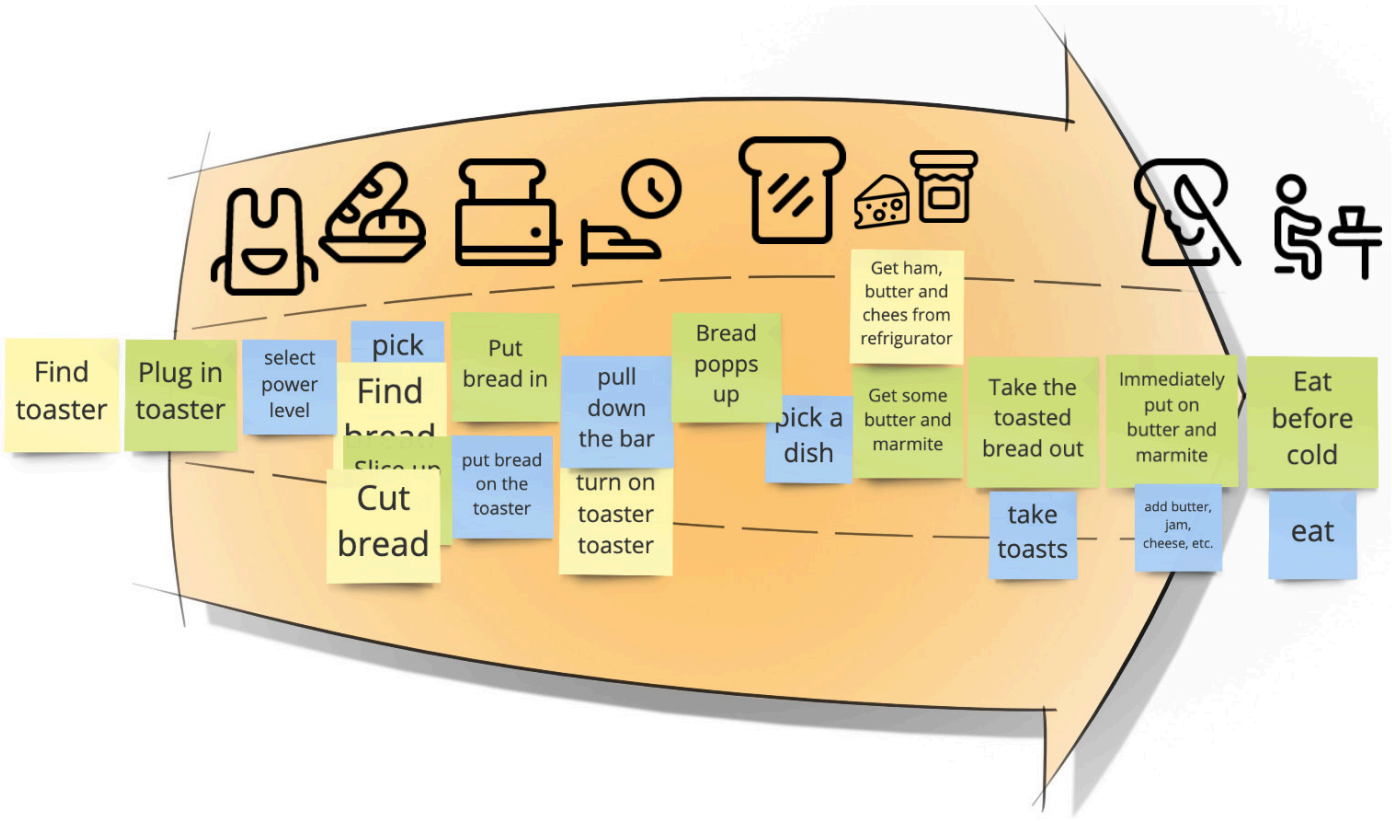


Figure 38. Result from test of icon sketching method

4.2 Sketching Activities

The sketching activities were tested in two stages first by having participants do the activity alone at home, and secondly by testing them in a workshop. The activities that were tested at home were *Picture the Problem, Storyboarding and Elevator Pitch*. In the workshop the activities *Copy Journey, Picture the Problem and Storyboarding* were tested. All the activities were executed with relative ease and within the given time. Instead of going into the results of each activity in detail, the most influential results from each activity will be covered.

Picture the Problem

In the activity picture the problem the participants were advised to make frames around the individual sketches that they made. Two of the participants followed this instruction and made frames around all of their sketches, while one only made borders to separate some sketches. Looking at the results the pages where all the sketches have frames around them are perceived as “tidier” than the sketch that only has borders between the sketches.

In addition to this, two participants wrote text in connection with all of their sketches, while one only added text to some of the sketches. Looking at the results, the text is seen as helpful in understanding what is depicted in the sketches, especially if the motif of the sketch is unclear.

For the collaborative part of the activity, the participants commented that the biggest challenge was to know what to look for between the sketches. More time for discussing between the participants and a more structured approach for how to make the connections was needed. To structure the collaboration more, the participants suggested that the elements that were used for marking the connections (circles, lines and sticky notes) could have been prepared beforehand and put to the side of the activity, with color codes and probes that the participants could use for finding connections between the sketches.

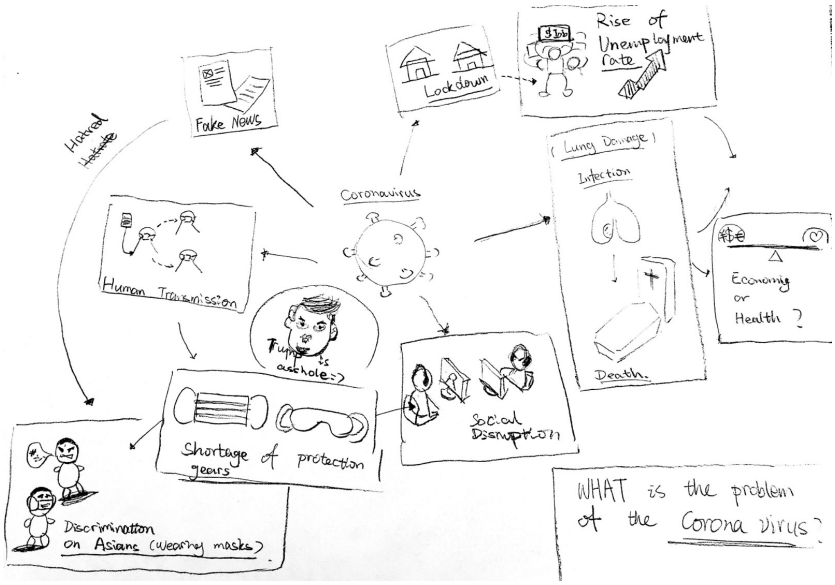


Figure 39. Resluts of individual tests of picture the problem

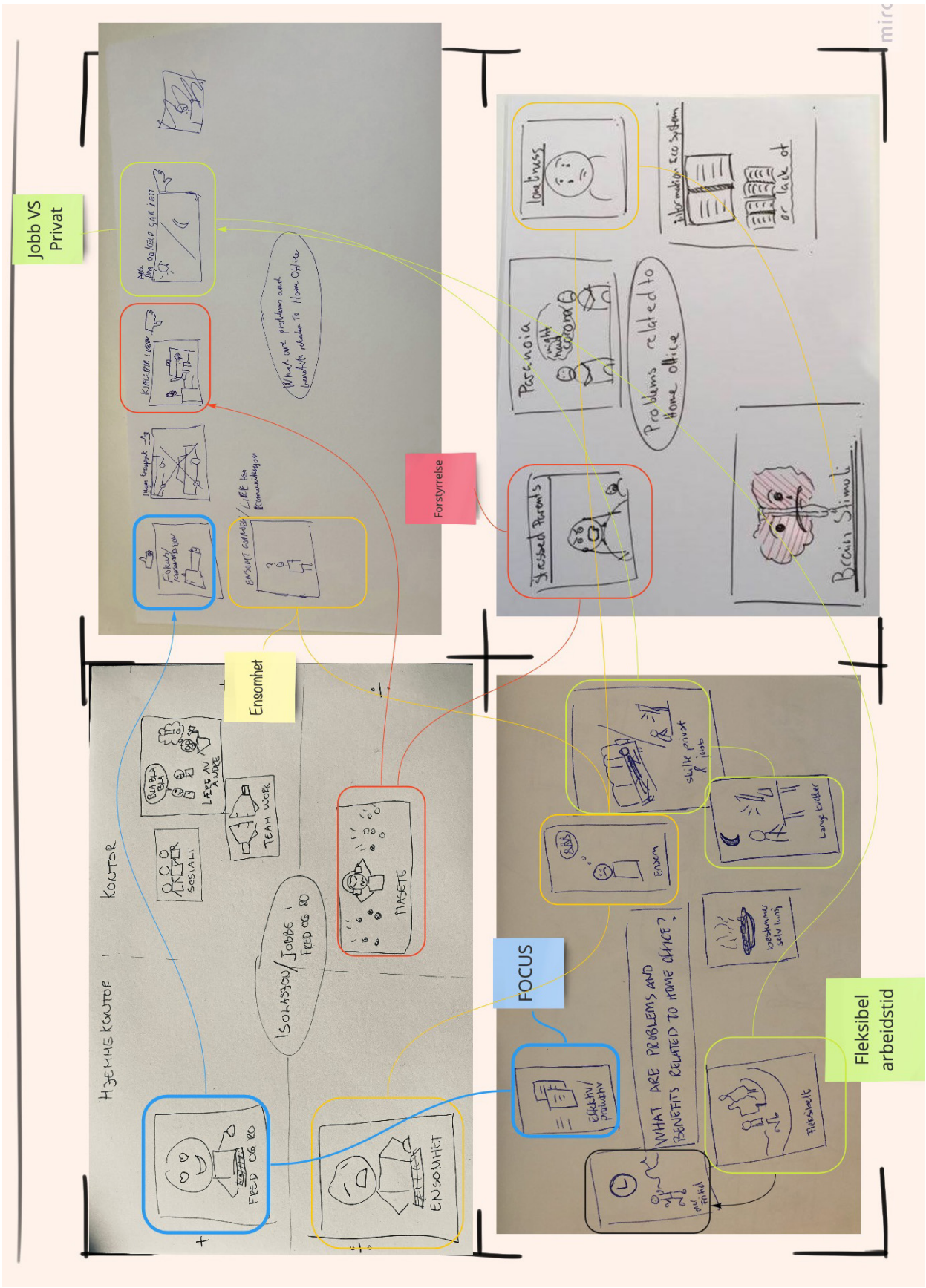
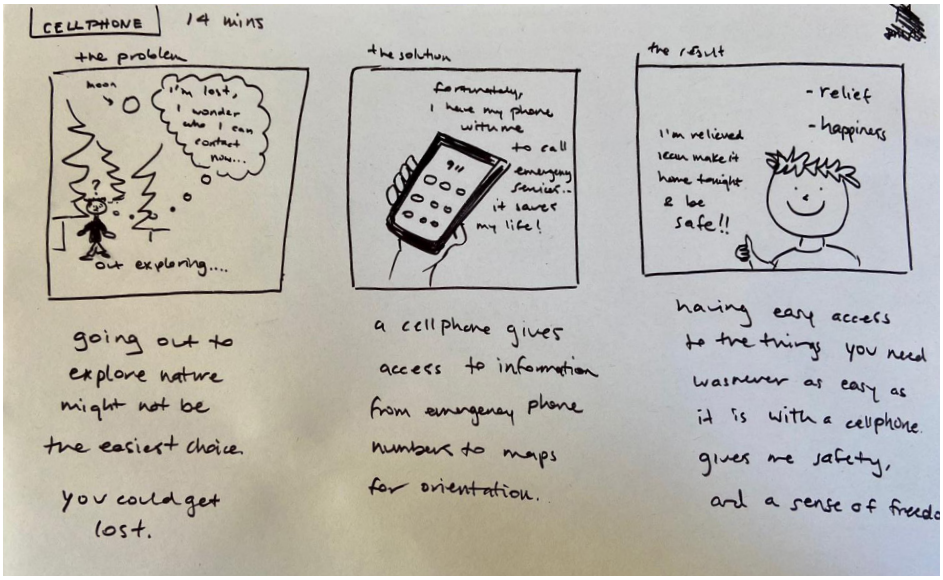


Figure 40. Resluts of picture the problem fom workshop test

Storyboarding

The results of the activity Storyboarding, showed stories centered around a user, including human emotions, the thoughts of the user, as well as the technical solution to the problem of the user. The participants commented that the format helped them understand each other's ideas.



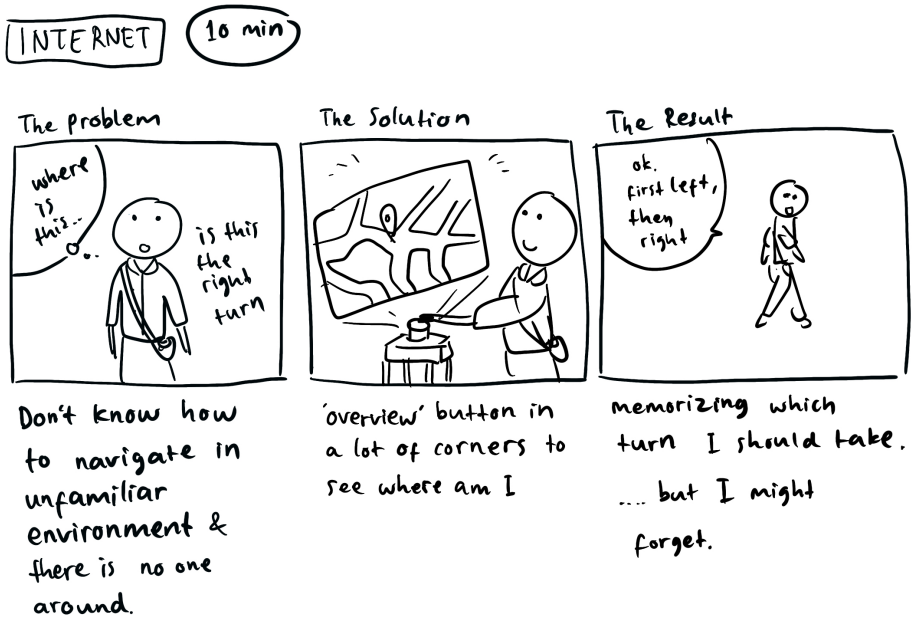


Figure 41. Resluts of individual tests of storyboarding activity

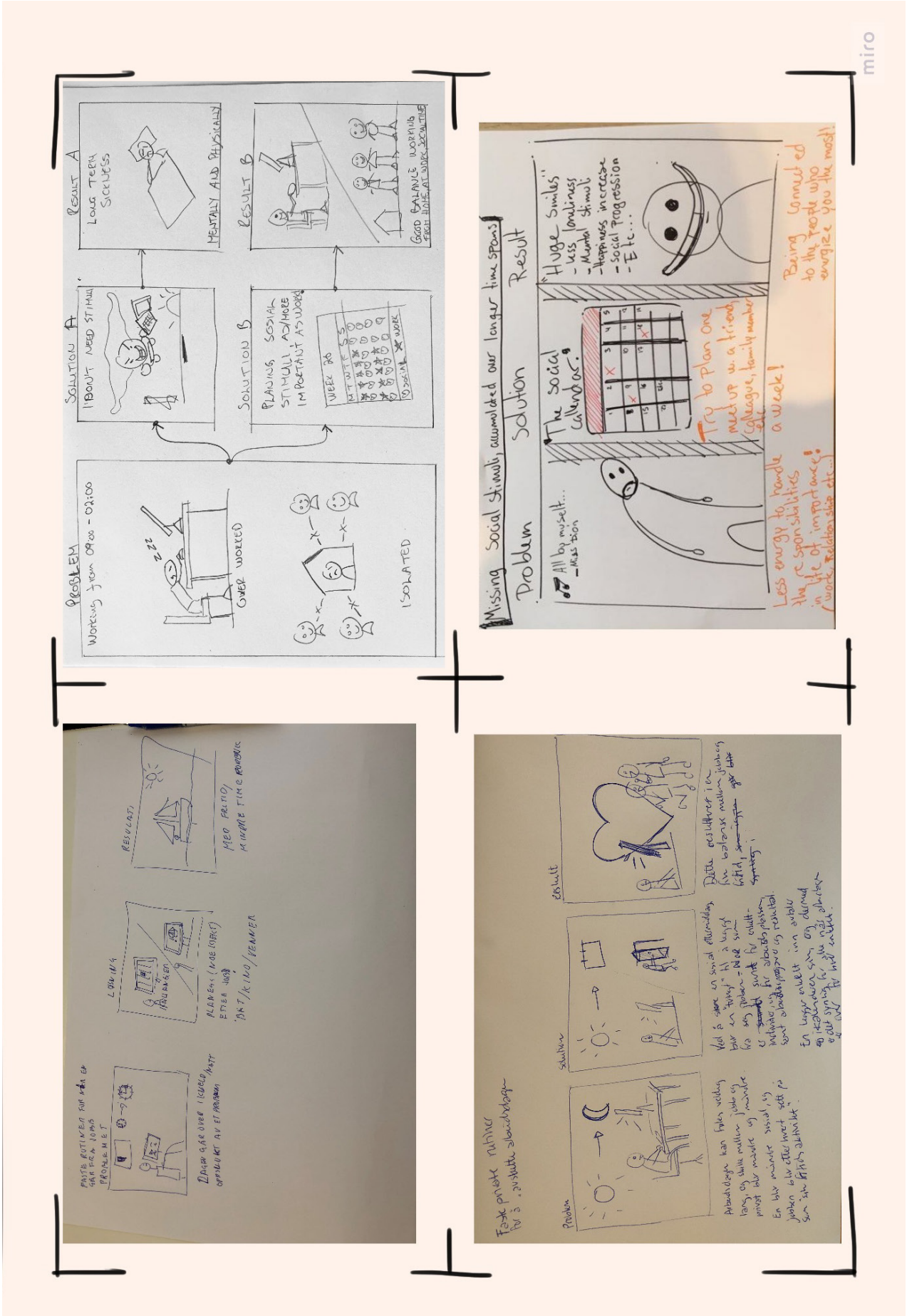
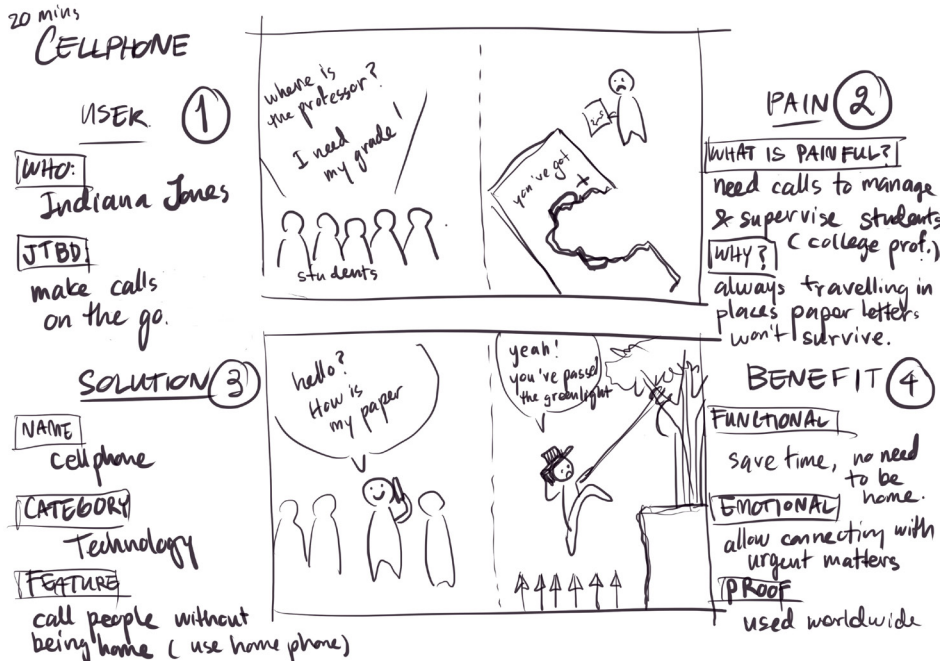


Figure 42. Resluts of storyboarding activity from workshop test

Elevator Pitch

In the activity elevator pitch, the participants deviated from the template by sketching the situations of the user in four frames, instead of two frames as it said in the instructions. The participants explained that this was because they wanted to show the full story, and that two frames became too limiting for this. Looking at the results, the frames and the adjacent information categories fit, however the flow between the different frames is not intuitive.



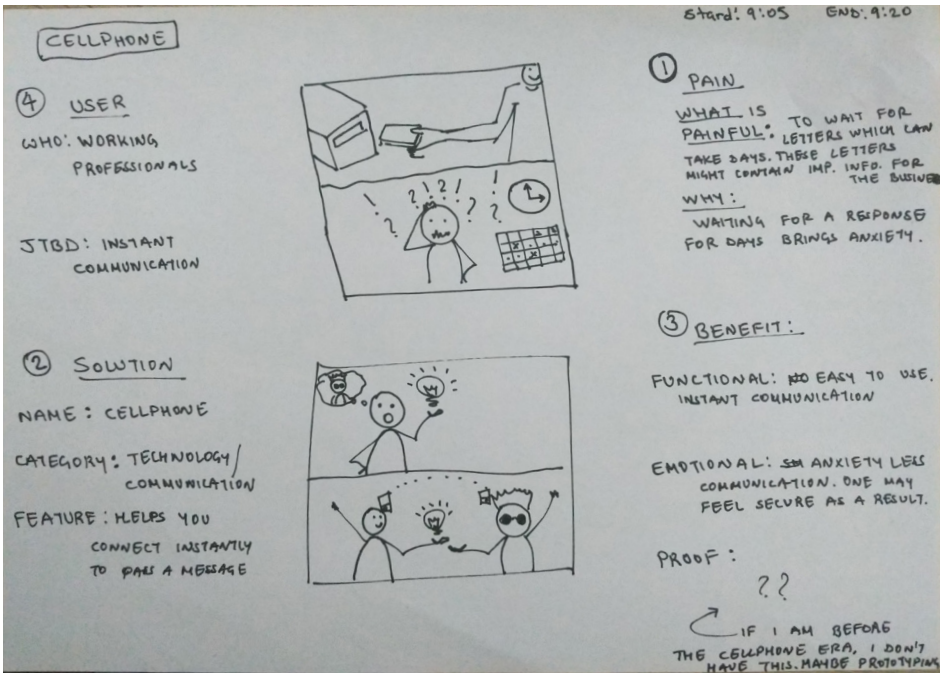


Figure 43. Resluts of individual tests of elevator pitch

Copy Journey

In the activity Copy Journey the participants made sketches that were significantly different from the example, however some elements were copied into their sketches. The participants commented that the Copy Journey activity was useful for testing out ways of sketching from the cheat sheet, without having to also come up with ideas at the same time. In addition to this the activity was mentioned as useful for finding a good workflow of for photographing and uploading the sketches.

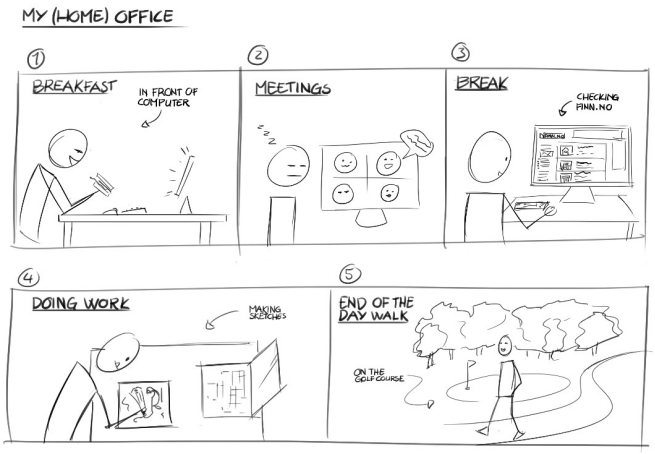
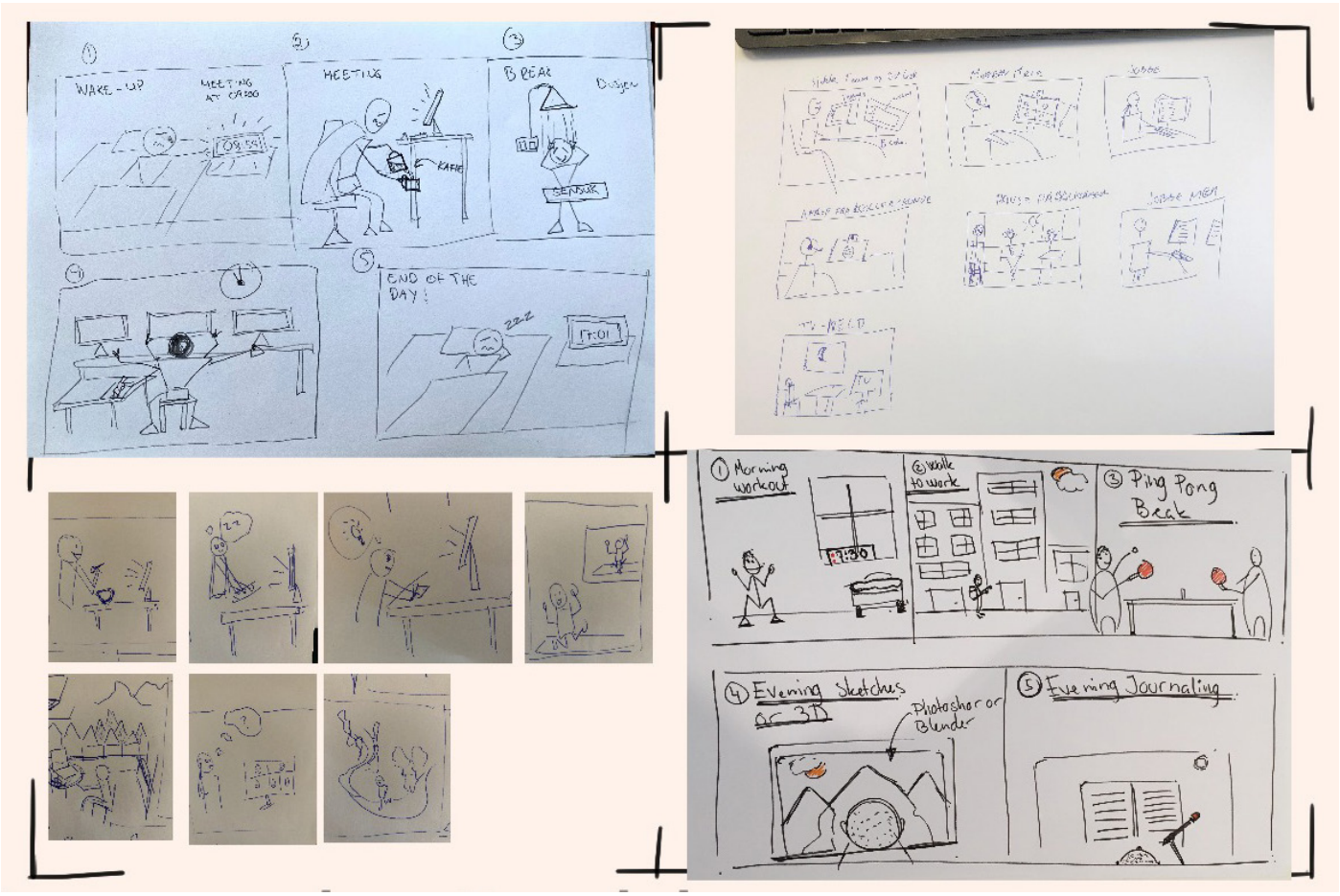


Figure 44. Resluts of copy journey activity from workshop test



In general, the participants said that using sketching activities in the workshop made the it more fun and inspiring than normal workshops. In addition to this, the sketches made it easier to explain and understand things. They felt that more information was being conveyed because they used both visual and textual information. The instructions and examples were seen as helpful for preventing misunderstandings, because they were accessible at all times.

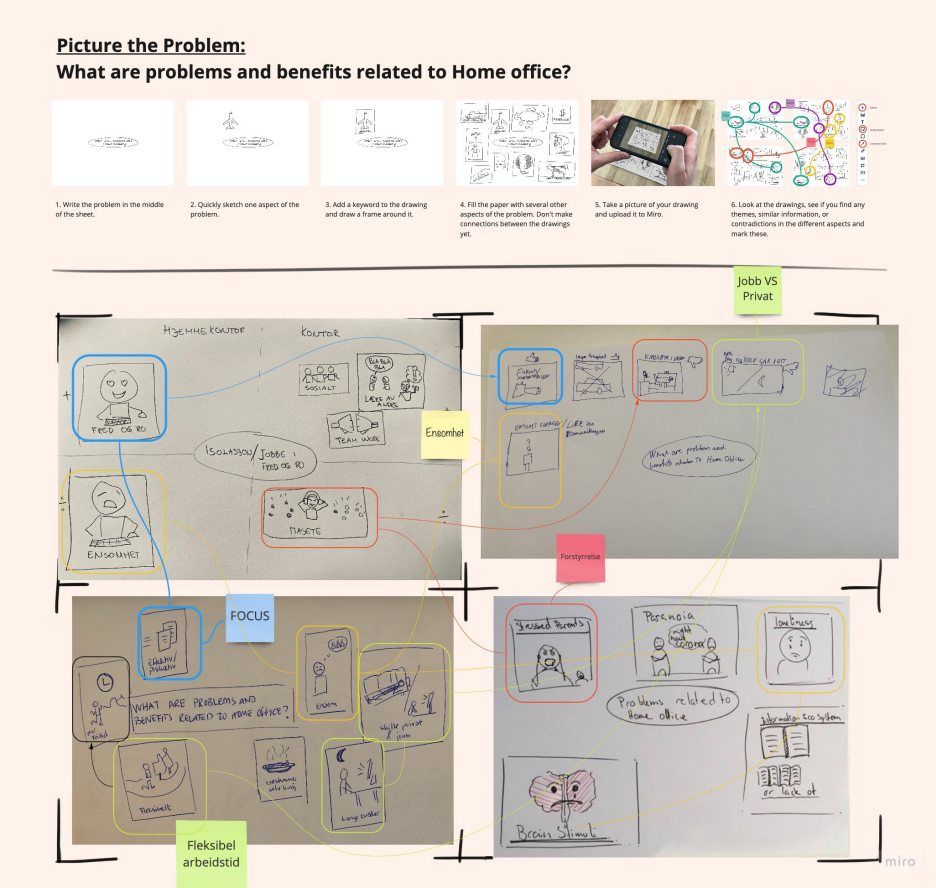


Figure 45. Example of how the instructions were set up in relation to the activities in the workshop

Looking at the workshop as a whole, the participants became increasingly more aligned in their thinking. In the activity Picture the Problem, several problem areas were defined. One of these problem areas was chosen as their main focus and a problem statement was made. Based on the problem statement ideas in many different directions were developed. After the ideation the participants iterated on one idea each in the activity storyboarding. The participants were free to iterate on any of the ideas from the ideation. Despite this, the participants ended up developing four very similar solutions in this activity.

4.3 Sketching Cheat Sheet

The sketches from the workshop showed clear signs that the sketching cheat sheet was used as inspiration when making the sketches. The way the people, the objects and the situations in the sketches were drawn, had in many cases strong connections to the examples in the cheat sheet.

Reflecting on the influence of the cheat sheet, the participants felt that it was very helpful for the workshop. The cheat sheet laid the ground rules for how to sketch in the workshop and explained how to make simple sketches that communicate. The participants felt that this would mean that people would be more willing to participate as the people who were skilled sketchers and the unskilled sketchers could make sketches with a similar visual language. The "rules" that were defined in the cheat sheet thereby took away the hierarchy of who was good at sketching and who was not in the group. This was seen as being very important in situations with clients, as having different sketching abilities could be demotivating for some participants and thereby damaging to these situations.

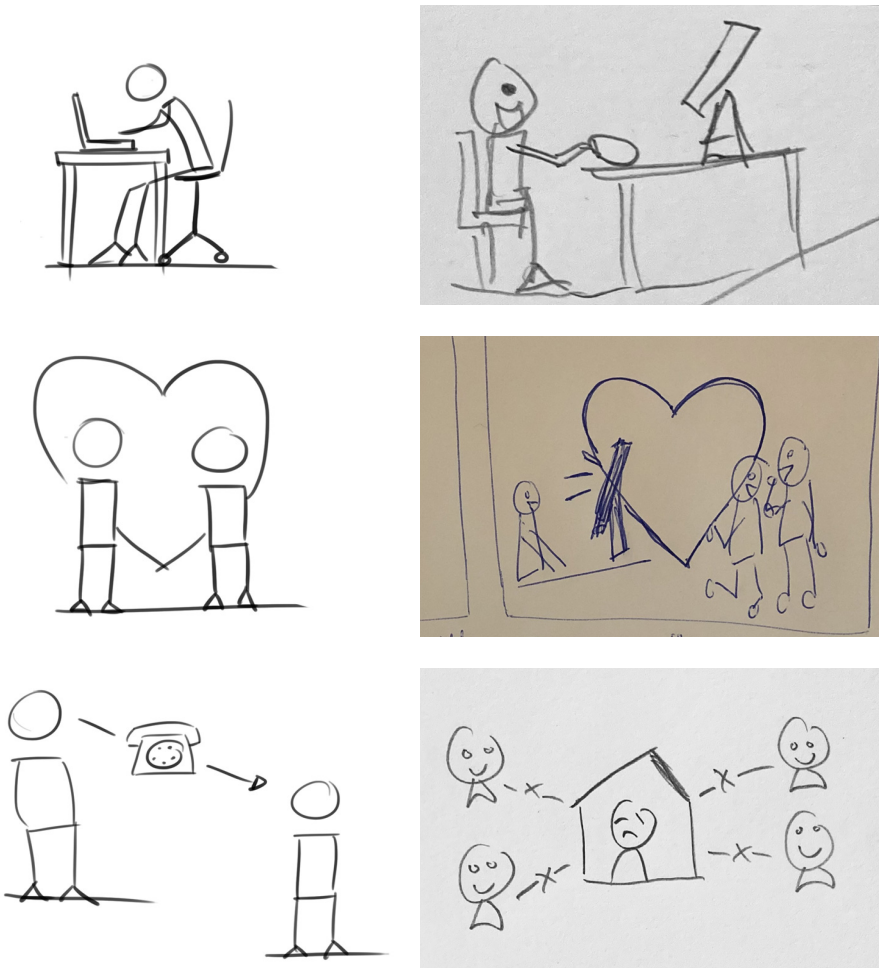


Figure 46. Comparisons of sketches from the cheat sheet and sketches that were made by the participants

4.4 Service Model Canvas Visual Reasoning

The experiment with the service model canvas worked as intended and the participants were able to place many sketches within the SMC. The sketches are clearly relevant to the fields where they are placed and looking at the different fields in relation to each other, the sketches that are placed start to build up a coherent picture of the project that would be planned in the canvas.

However, when reflecting on the activity, the participants felt that it was more important to define the different fields of the SMC specifically with words rather than with sketches. Their concern was that the sketches could be misunderstood at later stages, but that the sketches could be used to support the textual information. The suggestion from the participants was that the sketching was integrated with the SMC in some other way, for example by having a template where the different parts of the SMC was represented and sketched out.

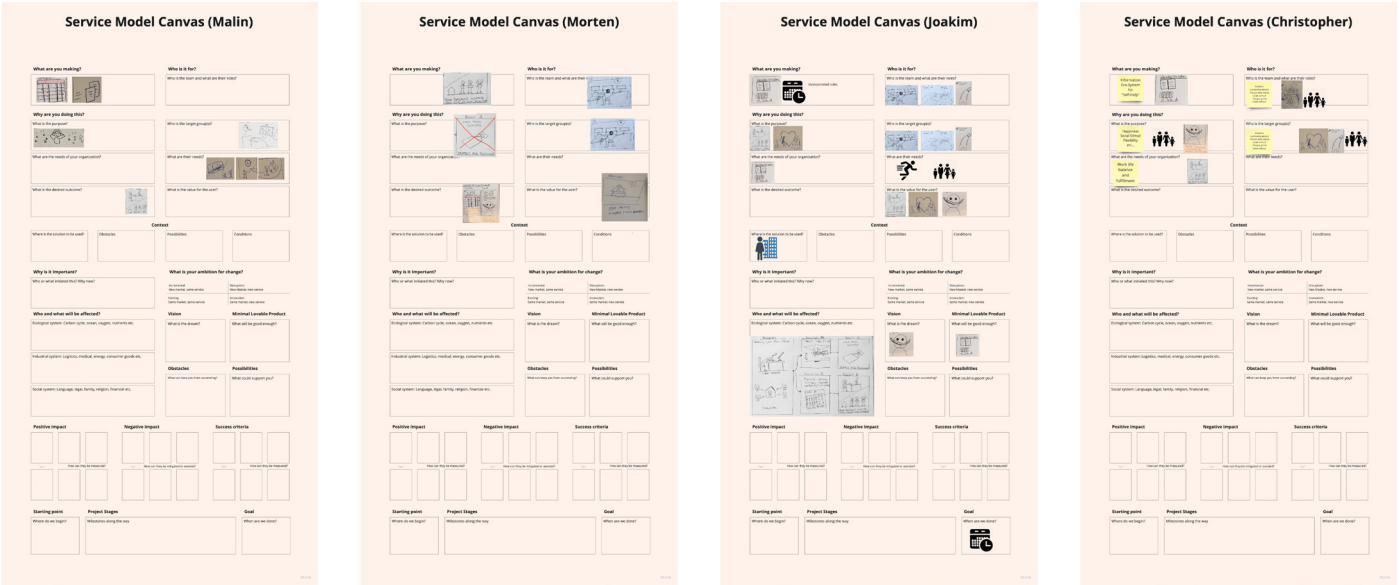
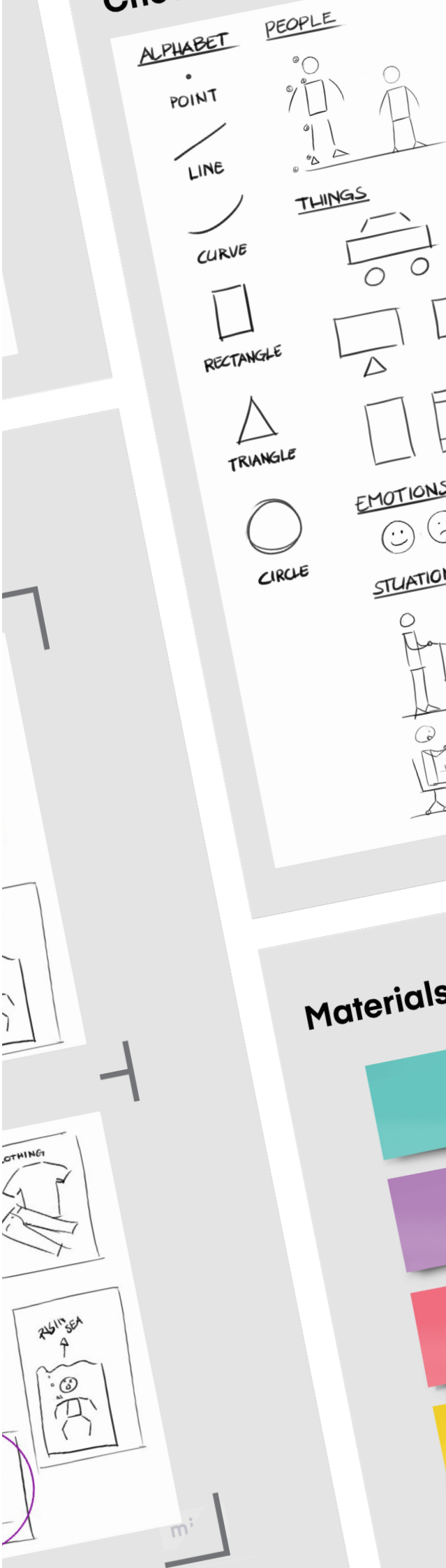


Figure 47. The service model canvases were only partly filled out as the experiment was cut short, as the workshop was running out of time

5 Discussion



The experiments and results led to the development of the toolkit for sketching in remote collaboration. In this chapter the results will be discussed, and it will be explained how the results led to the development of the toolkit. In addition to this each part of the toolkit will be explained and it will be explained how the toolkit relates to the many questions and requirements that were raised in the research chapter.

5.1 Toolkit Development

Sketching Method

Based on the results from the test of the three methods for sketching, the analogue first method was chosen as the best option and the method that would be the basis for the activities in the toolkit.

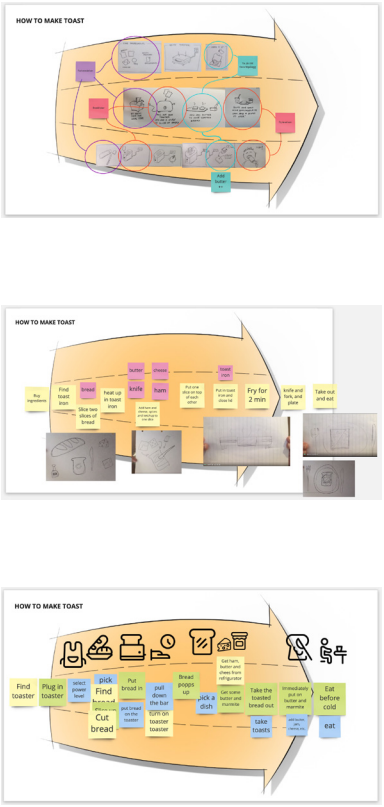


Figure 48. The skethces and the textual information was seen to comliment each other better in teh analuge first sketching method (top) than the other two methods

The first reason for this decision was because when comparing the analogue first and digital first method, the digital first method seemed to evoke more judgement by the participants towards their own sketches. Both in the digital first method, as well as in the analogue first method, certain participants expressed their low self-esteem towards sketching. However, in the analogue first method the sketching was done without any hesitation. While in the digital first method, the participants were observed throwing away sketches and having to look for reference pictures online before completing their sketch, which slowed down the sketching process. This contrast was thought to be because of how the sketching part of the methods and the collaborative parts of the method were sequenced differently in the two methods, and how this might have given different expectations for the purpose of the sketches. For the analogue first method, the sketches were made at the start of the process. This meant that the participants had to decide on the content of the sketch at the same time as they were making it. For the digital first method the sketching was placed at the end of the activity, and the contents of the sketches had been decided on in the start of the activity. The fact that the content was already known in the digital first method, is thought to have brought with it an expectation that the sketches should be an exact depiction of this content, rather than sketching being a means to explore the content as it was thought to be in the analog first method. The underlying expectation that the sketches should be an exact depiction of the content, is thought to have created more pressure for the participants and caused them to be more judgmental towards their sketches. A Judgmental mindset is something that should be

avoided in most parts of the iCPS process (Heijne & van der Meer, 2019). Therefore, the analogue first method was considered as a more suitable method than the digital first method.

The second reason for choosing the analogue first method, is because the sketches and the textual elements were seen as complimenting each other better in this method than in the other two methods. In the digital first and the icon method, the sticky notes contained the detailed information and the sketches, and the icons mirrored this information by depicting what was written down on the sticky notes. The value that the icons and sketches brought to these two methods was that they gave an overview of the information. In the analogue first method, the sketches contained the detailed information, while the sticky notes that connected the different sketches gave insights towards what type of information the sketches contained. Thereby the sketches and the textual elements generated using the analogue first method, create a model that contains more information than the models that are generated through the other two methods. As mentioned earlier, creating as many options as possible is an important principal in iCPS. The analogue first method is seen as more suitable for iCPS than the other two methods, as it brings more information into the process and thereby also provides more opportunities for new associations that can inspire ideas.

The sketches from the digital first method had a quite thin line weight. This made the sketches hard to read and the sketches didn't draw attention to themselves. This was in contrast to the sketches that were made using the analogue first method, where the line weight is considered to be appropriate as the sketches were easy to read and had an appropriate level of detail, as well as attracting the proper amount of attention. This difference in line weight was seen as a result of the participants in the two tests making the sketches at different sizes. In the analogue first method the participants made several sketches on the same piece of paper, making the sketches smaller and the line weight thicker, while in the digital first method the participants made each sketch on an individual piece of paper, making the sketches bigger and the line weight thinner.
Based on this insight, it was determined that the method requires a template that structures the sketches so that several sketches are placed on the same page and they are drawn at the appropriate size. In addition to this, the template was thought to ensure that

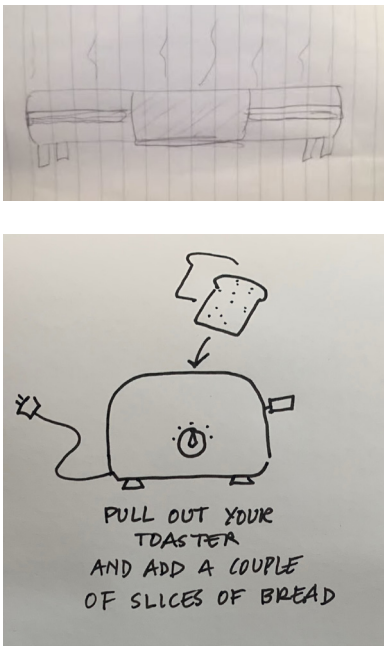


Figure 49. By making smaller sketches the line weight became thicker in relation to the sketch and the sketch was easier to understand

the results from each participant was comparable, something that was important for the collaborative part of the method.

The icon method proved to be useful for quickly creating visual overview of the textual information. The method had the advantage that the visuals that were used weren't influenced by the sketching ability of the participants. This meant that there was a low entry level for participating in the method and the method could be used in workshops without involving much risk. The method was tested further in the workshop test, with the activity icon clustering. (This activity can be found in Appendix F. However, the method was not included in the toolkit as representatives from Idean felt that the purpose that the method fulfilled wasn't needed in the workshops.

Additional insights that were gained from the test of the three methods were that photographing with a mobile phone and uploading to the digital whiteboard, was as feasible as photographing with a web cam. In the third test, the sketches were photographed by the participants with their mobile phones and this was the way this step of the method was instructed in the toolkit.

Finally, the comment that using analogue sketches in a remote workshop brought more of a personal touch to the workshop, is a valuable insight that sketching can break down some of the distance that is created when collaborating remotely.

Sketching Activities

The sketching activities were developed to ensure that they could provide valuable outcomes in the remote workshops. The activities that were used were inspired by and adapted from existing activities that already had proved their value. Thereby the challenge with the activities was to adapt the activities to the analogue first method, so that they could be used in remote workshops. All the activities that were tested in their full format, i.e. copy journey, journey mapping, picture the problem and storyboarding, were executed by the participants without major problems. These activities were therefore considered successful and were included in the toolkit with minor adjustments.

The elevator pitch activity was only tested by participants individually. This test revealed major flaws in the template that the participants were supposed to follow. The participants were unable

to tell the full story of their idea using the template, thereby leading them to alter the template. In addition to this the result was not seen as communicating well as the template lacked a clear reading direction. Finally, the elevator pitch activity and the storyboarding activity proved to fulfill very similar purposes. However, the results from the storyboarding activity communicated better with a template that had a clear reading direction and where the participants were able to adhere to the template. Therefore, the storyboarding activity was seen as a better option and the elevator pitch activity was discarded.

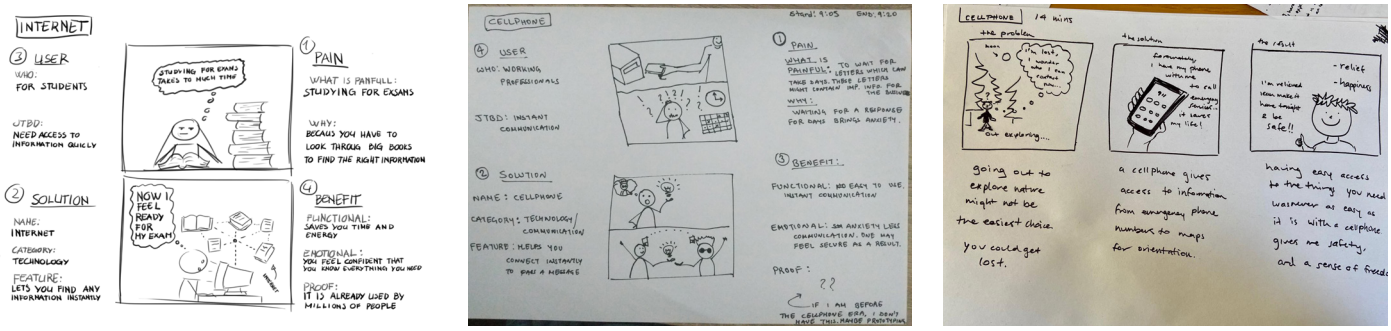


Figure 50. from the left: the instructions for the elevator pitch activity, execution of the elevator pitch activity, and execution of storyboarding activity

The insights that adding frames and text to the sketches made the results clearer, led to the templates of all of the activities to have frames around each sketch, and to include explanatory keywords and text for the sketches.

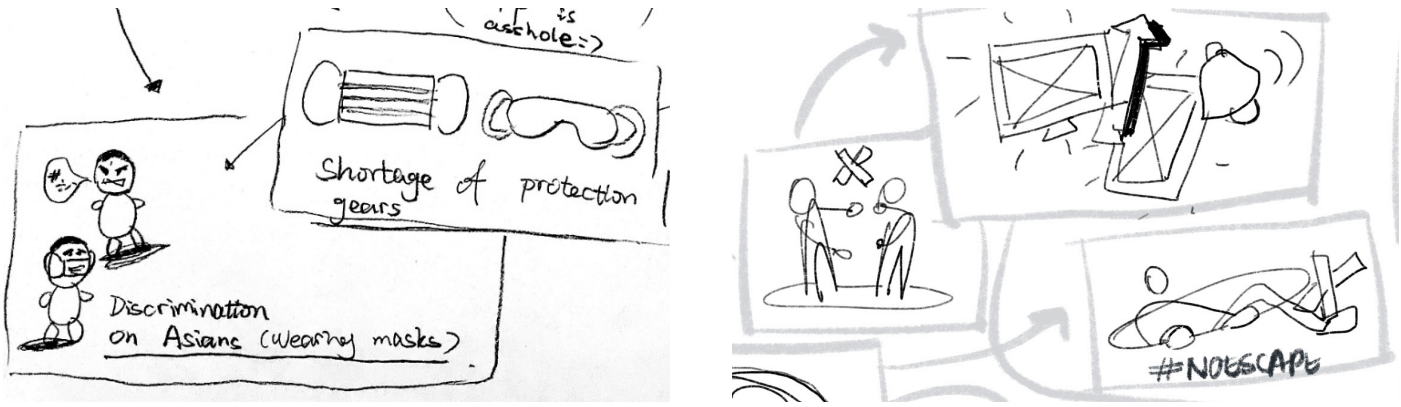


Figure 51. By adding text to all of the sketches it became easier to understand sketches with an unclear motife

As for how sketching activities can contribute to the outcome of workshops in different ways than textual activities, more testing is needed. The focus of the tests was first and foremost on achieving the technical execution of the sketching activities, and less attention was given to how the sketching activities could collectively contribute to a better outcome of the workshop. Despite this, the final solutions that were made individually by the participants were strikingly similar, although there had been no instruction or attempt to reach a consensus regarding which idea would be developed further in the last activity of the workshop. This result is a clear sign that the participants were aligned in their thinking of what the main problem was and how this should be tackled.

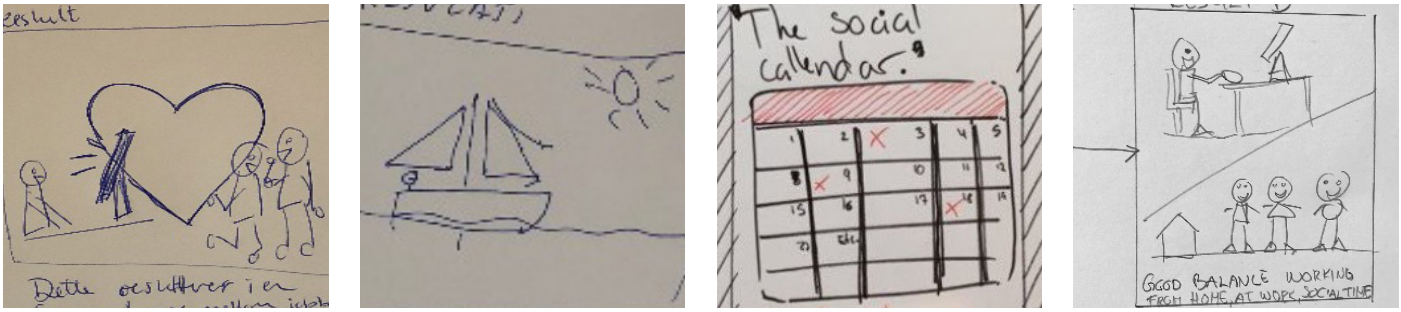


Figure 52. The solutions that the participants ended up with were all focused finding a good work life balance

To tackle the challenge of how the sketching activities could collectively contribute to a better outcome of the remote workshops, the visual reasoning canvas was developed. The thoughts behind the visual reasoning canvas will be explained in the service model canvas section.

Sketching Cheat Sheet

With the entirely positive comments from the participants towards the sketching cheat sheet, there was little doubt that it was perceived as a helpful tool for sketching in remote workshops. By dictating the way that the participants sketched, the sketching cheat sheet ensured that sketches communicated the essential information and avoided the participants rendering the sketches beyond this.

Service Model Canvas Visual Reasoning

In the experiment with the service model canvas, it was seen that the sketches that had been used in the workshop corresponds with the content of the SMC. This was despite the fact that the activities in the workshop hadn't been focused towards filling out

the SMC. If the activities had been focused towards filling out the SMC, the expectation is that the sketches would fit even better with the SMC. In contrast to this, the participants felt that it was more important to fill out the template with textual information to avoid misunderstandings with clients, and that the sketches were better utilized as visual support for the template.

Based on these insights, the *Visual Reasoning Canvas* was developed. The visual reasoning canvas is used to determine the most important insights gained when using sketching activities. The canvas was made to support the SMC, but can also be used separately from the SMC.

The canvas has three fields. In the top field the question that the activity tried to answer is filled in. Underneath this the sketch or sketches that represent the most important insight is placed. At the bottom keywords or a short sentence about the insight is written down.

The canvas is intended to be used at the end of sketching activities, in order to reach a consensus as to which insights from the activity the group should take from it going forward. The value that the visual reasoning canvas is thought to bring into the workshop and to the SMC is that it creates transparency in terms of which decisions were made and how they were made. The visual reasoning canvas can aid memory in terms of which decisions were made and why. Moreover, anyone will be able to follow the whole reasoning process, from the raw material in the activity, to the insights that were specified in the visual reasoning canvas, to the specific information that was filled out in the SMC.

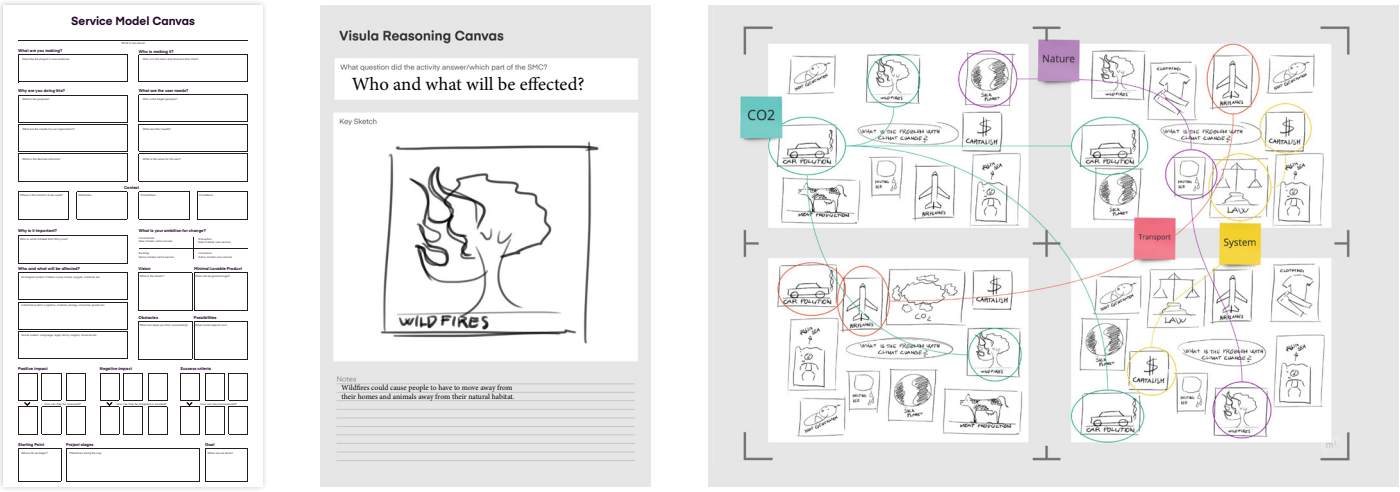


Figure 53. The visual reasoning canvas (middle) lets you follow the line of reasoning from the raw material to the service model canvas

Visula Reasoning Canvas

What question did the activity answer/which part of the SMC?

Who and what will be effected?

Key Sketch

Notes

Wildfires could cause people to have to move away from their homes and animals away from their natural habitat.

Figure 54. Example of the visual reasoning canvasvisual reasoning canvas

5.2 Final Components

The toolkit is focused on enabling designers at Idean to use sketching activities in remote workshops.

The toolkit is first and foremost designed as being used by the facilitator of the workshop when preparing the workshop and the activities. However, it also includes resources that will help the participants during and after the workshop.

Sketching Basics

The first section of the toolkit is comprised of sketching basics. The type of sketching that is explained in the section has the aim of being as simple as possible while still communicating well to the audience.

In the section there are several pages of sketching instructions and a sketching cheat sheet that can be used in the workshops.

The sketching instructions show the following: how to build up a sketch showing people, things, emotions and situations, the use of text, icons and arrows and which materials to use. These instructions are mainly intended for the facilitator, so that they have a clear picture of what the sketching will require of the participants.

The sketching cheat sheet is a summary of these instructions. This is a resource that is intended to be used in the workshops. At the start of the workshop, the way of sketching can be introduced using the cheat sheet, and throughout the workshop the participants can come back to the cheat sheet for inspiration on how to build up their sketches.

Sketching Method and Activities

In the second section of the toolkit, there is a practical method for how to make and share sketches in remote workshops, in addition to several sketching activities that use this method.

The method was made in order to find a practical way of making and sharing sketches, that enabled the participants to produce valuable sketches while at the same time being time efficient so that it didn't disrupt the flow of the workshop or the activity. The method divides the activities into two parts. The first part is individual sketching and the second part is collaborating around the sketches.

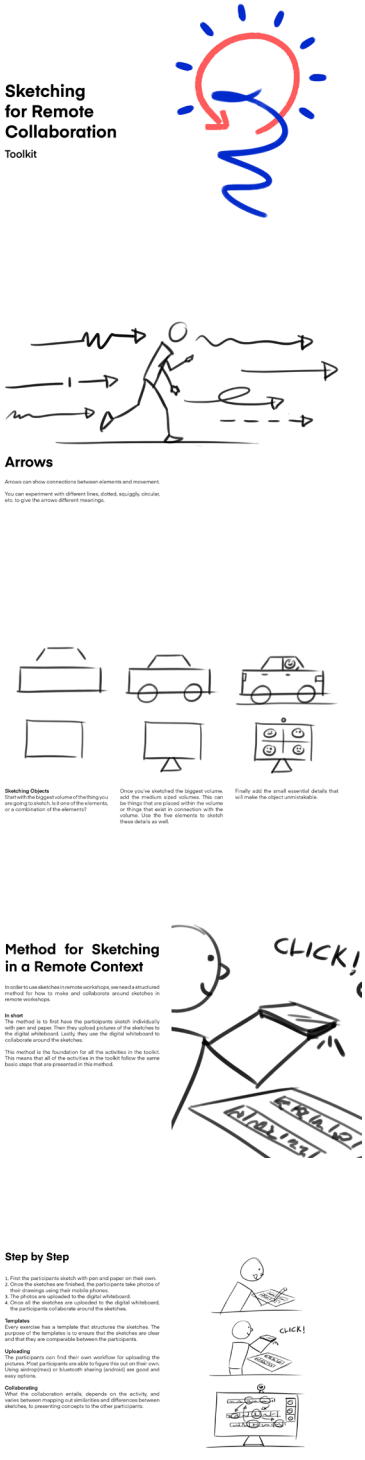


Figure 55. Example pages from the toolkit

In short, the method is to first have the participants sketch individually with pen and paper. Then they upload pictures of the sketches to the digital whiteboard. Lastly, they use the digital whiteboard to collaborate around the sketches.

The activities in this section all follow the structure of this method. Four activities were found and adapted to fit the method. One warm up activity – copy journey, two problem finding activities – picture the problem and user journey, and one solution finding activity – Storyboarding. The purpose of having a detailed description of the underlying method of these activities, is so that it will be easy to identify and adapt more sketching activities so that they can be used in remote workshops.

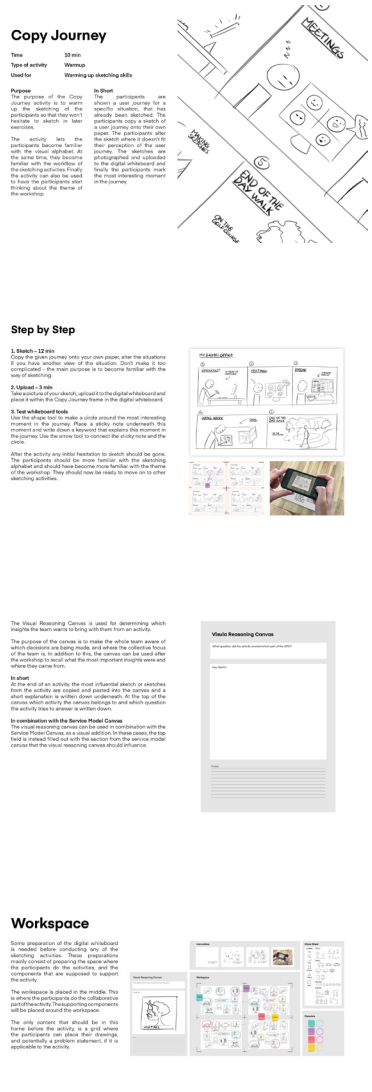


Figure 56. Example pages from the toolkit

Visual Reasoning

In this section the visual reasoning canvas is explained. This is a template that highlights the key insights that were gained from the activity, so that it is clear to everyone what insights the group take with them from the activity.

The template is made to inform the *Service Model Canvas,* which is a canvas that Idean uses to scope and structure their projects, but it can also be used on its own without the Service Model Canvas. The template has two fields. The top field is for specifying which question or part of a challenge the insights are supposed to inform. The bottom field is for placing the most representative sketches for the insights that were gained and to place keywords about what the insights were.

Setting Up for a Remote Workshop

In the final section, there are guidelines for how to set up a digital whiteboard for an activity. The setup contains five frames that serve different functions during the activity.

At the top of the layout the instructional material is placed, since this is where the activity starts. First there is the instructions for the activity, and to the right of this the sketching cheat sheet is placed. Underneath the instructional material, things that are used in the activity are placed. In the middle, the setup is the workspace frame. This is where the participants will upload their sketches and collaborate around them. To the right of the workspace frame is

the materials frame. Here “materials” such as sticky notes, circles or arrows that will be needed during the collaborative part of the activity can be placed. To the left of the workspace is the visual reasoning canvas, which will be used at the end of the activity to decide what the most important insights were.

5.3 Toolkit Relation to Research

In the research chapter, several questions and requirements that the toolkit had to take into account were raised. It will now be explained how the toolkit has taken these questions and requirements into account.

Benefits of Sketching

Five benefits of sketching in team collaborations were identified. These were:

1. Making thoughts tangible.
2. Creating a shared understanding for the concepts and ideas discussed.
3. Enabling shared creation between the group members.
4. Recording thoughts and aiding memory.
5. Uncovering patterns and relationships between different pieces of information.

The toolkit was designed with the intention that it should promote the benefits of sketching in remote workshops.

The activities in the toolkit are focused on the participates sketching their own perceptions, opinions and ideas. They visualize problems, experiences and solutions by making sketches of people in situations, thereby making their thoughts tangible.

The collaborative parts of the activities facilitate shared understanding, shared creation and the uncovering of patterns and relationships. By connecting different parts of each other’s sketches and finding insights between them, participants uncover patterns and relationships. By using each other’s sketches in this process, they are effectively creating together, as the outcome wouldn’t be the same without the input of everyone’s sketches. Finally, the insights that they uncover, create a model that represents their shared understanding of the problem or the solution that they are working on.

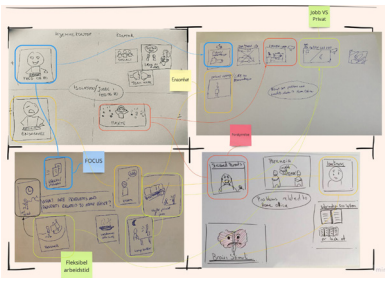


Figure 57. The functions of shared understanding, shared creation and patterns and relationships all appeare in the collaborative part of the activities

The recording of thought and aiding memory is facilitated through the visual reasoning canvas. As already discussed, this canvas gives the participants the ability to follow the decision-making from the raw material in the activity, to the canvas where the most influential insights are highlighted, and in the cases where it is used, to the service model canvas where the specific information is written down.

Drawbacks of Sketching

The drawbacks of sketching that were identified were that:

1. Sketching could demand too much of the participant's attention, disrupting the group collaboration.
2. Sketching required extra commitment to the idea before it was sketched and sketching therefore introduced more judgement of the ideas.
3. Sketching brings with it an assumption that is about aesthetics and personal expression, and thereby made people hesitant to sketch.

The issue of attention was managed by clearly defining when the participants focus should be on sketching and when their focus should be on collaboration. In the analogue first method, the activities are divided into two parts. First an individual part where the attention of the participants is on making their own sketch, and then a collaborative part, where the attention is on collaborating around the sketches.

The issue of judgement towards the ideas was managed by avoiding activities that focused on fast paced ideation. In fast paced ideation activities, which are used in the idea finding stage, the main focus is to come up with as many ideas as possible, without judging the quality of the ideas as they are being generated (Buijs & van der Meer, 2013). Therefore, the sketching was not seen as appropriate for this stage of a workshop and the activities that were developed were situated in the problem finding and solution finding stages.

People's hesitation to sketch was managed with the sketching cheat sheet and the warm-up activity copy journey. The cheat sheet laid the ground rules for how to sketch, focusing on functional sketches that communicated well while being easy enough to be sketched by anyone. The copy journey activity let the participants practice these types of sketches before they had to use it in the following activities.

Figure 58. The attention of the participants is mitigated by the steps of the activities, in the first part of the activity the attention is on their individual sketch, while in the second part of the activity the attention it is on the collective sketches of the group

Making Meaningful Sketches

From the interview with sketching-expert Hanne Wetland, the insights about how to achieve meaningful sketches in a workshop, were:

1. The main purpose of the sketch is to get one point across to the audience and the sketch should only be rendered to the degree where this is achieved.
2. Different things are relevant in different domains. Therefore, an awareness of the things that are relevant to sketch in a specific domain is needed.
3. Sketching situations involving people is a meaningful way to use sketches in a collaboration, as this makes the conversation more user-centered.

As explained earlier, the sketching cheat sheet was responsible for ensuring that the sketches that were used in the workshop were at a level where they communicated the essential information, but not rendered beyond this point.

In the toolkit, the warm-up activity copy journey gives an opportunity to prepare the participants for how to make domain specific sketches. The journey that the participants copy in the activity can be prepared to fit the theme of the workshop. Thereby, as the participants sketch the journey, they are also exposed to sketching things that are specific to theme of the workshop.

Because of the insight that situations with involving people was thought to be a particularly good way to use sketching in workshops, many of the activities that were developed were focused towards this. The activities, copy journey, user journey and storyboarding are focused on sketching situations with people.

Figure 59. The activities copy journey, storyboarding and user journey, all focue on sketching situations with people

Integrated Creative Problem Solving

Regarding integrated creative problem solving, the considerations that the toolkit had to make were:

1. Which sub processes of iCPS should it influence?
2. Which stages of the workshop should it influence?

The toolkit influences three of the four sub processes. The visual reasoning canvas influences the acceptance finding process, by making sure that there is transparency in which decisions are being made during the workshop and that these decisions can

be reasoned for after the workshop. The activities influence the content finding process, by contributing to the different stages of the workshop that lead to a solution for the problem in question. Finally, the toolkit influences the project management process, by providing practical guidelines for using sketching in remote workshops, such as how to organize the digital whiteboard, how to make your own sketching activity and what type of sketching should be used. The information finding process was not found to be relevant with regard to sketching, and therefore the toolkit does not take this into account.

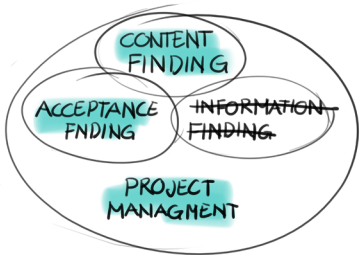


Figure 60. The iCPS sub processes that were adressed in the toolkit were content finding acceptance finding and project managment

As already mentioned, the activities in the toolkit are focused towards the problem finding stage, as well as the solution finding stage. The activities were not focused towards the idea finding stage, as sketching could disrupt this stage by introducing judgment and the withholding of ideas by the individual participants.

Figure 61. The activities in the toolkit are made for the problem finding and the solution finding stages

Remote Collaboration

Regarding how the toolkit would relate to remote collaboration, it had to be determined:

1. If it would cater to formal communication or if it would to create a more informal communication in the workshop?
2. How it related to the use of different channels and when to work in which channels?

In the toolkit, communication during the sketching activities cater to the already formal communication in the remote workshops. The communication was defined by the analogue first method, which splits the activity into an individual part and a collaborative part. The reason why it was chosen to have such a formal structure in the activities, was both because of the issue of the participants attention, which was discussed earlier, as well as based on the comment from Emily Lin, that the right information had to be shared at the right moment. By catering to a more formal communication, it would thereby be easier for the participants to follow the activity, as well as it would be easier for the facilitator to control the workshop.

The visual communication in the toolkit is done through only one channel, the digital whiteboard. However, two mediums are used: Analogue sketching for creating the visual material, and the digital whiteboard for collaborating around it. By using these two mediums, the communication in the workshop is controlled, because the synchronicity of the medium is matched with what is needed for the given task. When sketching, the participants can't see the other participant's sketches, and the attention will therefore not be taken away from their own sketch. However, when the sketches are uploaded to the whiteboard, all the participants are able to view all of the sketches at the same time, and their attention can be on collaborating using all the sketches. In this way the mediums that are used contribute to the control over the participant's attention.

Observation of Remote Workshop

From the observation of the remote workshop, the insights that were taken into account were that:

1. The preparation of the digital whiteboard before the workshop was essential, as it structured the workshop and the activities.
2. There was a lack of communication between the participants and there seemed to be little evidence that the participants built on each other's ideas.

In the toolkit the preparation of the digital whiteboard is formalized in a layout that goes together with the "analogue first" method and the activities. The layout was developed based on experience from the tests, as well as the workflow of the method and the activities. The layout is made so that it has an intuitive workflow, starting with the instructional material, then moving on to the actual workspace where the collaboration takes place, accompanied by the materials that are needed for the activity. Finally, the visual reasoning canvas is placed to the left of the workspace, so that when returning to the canvas after the activity, you are met with the main insights first in the visual reasoning canvas, and then the raw material in the workspace.

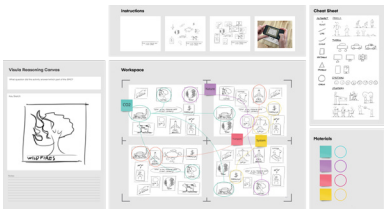


Figure 62. Setup for activity in digital whiteboard activity

In terms of communication between the participants in the workshop, the activities are seen as supporting both verbal as well as visual communication between the participants. First of all, in the collaborative part of the activities, the participants used verbal communication to execute the task together. However, the

participants commented that more time for discussing between the participants in between the individual and collaborative parts of the activity would have made the collaboration easier. This insight would be taken into account in the instructions of the activities in the toolkit. Secondly the sketches were seen as giving the participants a second means of communication other than verbal. The participants felt that more information was communicated when using sketches and it was easier to understand the thoughts of the other participants.

Interview Emily Lin

From the interview with Emily Lin, the main insights that were gained were that:

1. Because most people are unfamiliar with remote workshops, a thorough introduction to the tools as well as the activities is needed.
2. The activities have to be simple enough for the participants to follow them, but at the same time create a valuable outcome for the workshop.
3. The activities have to be structured so that the right information is communicated from the participants at the right time, since the communication is especially fragile.

In the toolkit, the introduction to the way of working in the sketching activities and in the digital whiteboard is mainly managed by the warm-up activity copy journey. The activity ensures that the participants have the ability to practice the way of sketching as well as the workflow for photographing and uploading the sketch to the digital whiteboard. The version of the activity that was tested did not involve practicing how to use tools, such as sticky notes and arrows, in the digital whiteboard. However, in the version that was included in the toolkit, an additional step was added to the activity, so that the participants also had the chance to practice these tools during the activity.

Figure 63. Warm-up activity copy journey

The activities that were included in the toolkit, were executed in the tests by the participants without significant problems. This would indicate that the activities were at an appropriate level of difficulty for the participants. In the workshop test, the participants were able to use the sketches that were made in the workshop, to fill out parts of the service model canvas. This would indicate that the sketching activities generated valuable outcomes. However, as

already mentioned, the main focus of the tests was on the technical feasibility of the sketching method and the activities, and not on the value of the activities. Therefore, more testing is needed in order to know what value was achieved by using these activities that would not have been achieved by solely using textual activities.

The structure of the activities and the mediums that were used controlled which information was contributed to the activity at which time, so that the facilitator could control the communication in the workshop and the workshop could progress as planned.

The Theory of Planned Behavior

From the theory of planned behavior, the questions that had to be taken into account were:

1. Which factors will be used to achieve the behavioral change?
2. How will the toolkit influence the factor(s), so that the behavioral change happens?

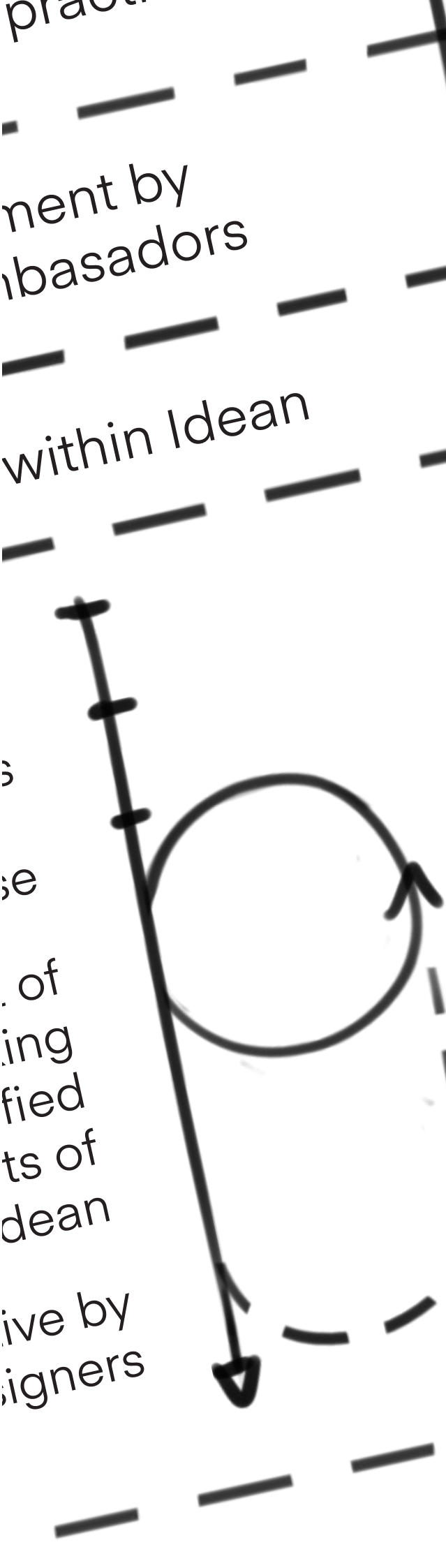
The toolkit focused on the factor of perceived control over the behavior. For the facilitator the toolkit was meant to provide control over the conditions that are involved in setting up and conducting a remote workshop that was focused around sketching activities. The toolkit is set up so that the facilitator should get the practical knowledge of how to set up the workshop, but also so that they have the knowledge of sketching and the underlying method that the activities are based on.

For the participants, the toolkit mainly focused on gaining control over the behavior by providing sketching instructions in the sketching cheat sheet and through instructions for each activity.

The attitude towards the behavior would be influenced by the activities' ability to generate valuable outcomes, as this would be a positive consequence of the behavior. The toolkit is designed with the intention of providing the conditions for creating valuable outcomes, and therefore should influence the attitude towards the behavior in a positive way.

The subjective norms towards the behavior would be influenced by how well the toolkit would be implemented and used at Idean. Therefore, the effects of the toolkit on this factor cannot be known before it is handed over to Idean. It is expected that the success

of this factor would be highly dependent on the other two factors, so that if the toolkit was able to offer control over the behavior, and a positive attitude towards the behavior, more and more people would use the toolkit, and the subjective norms towards the behavior would also become positive over time.



6 Implementation Plan

As discussed with regard to the toolkit's relation to the theory of planned behavior, the toolkit mainly provides the users with control over the behavior of sketching.
The toolkit is thereby just a starting point for implementing the behavior and steps have to be taken to also achieve a positive attitude towards sketching and positive norms towards sketching.

In order to achieve this a proposal for an implementation plan was made. The implementation plan outlines in what way Idean should start using the toolkit, how they should develop if further and what potential a focus on sketching as central part of their practice could have in the long term.

The implementation plan is divided into three stages. The first stage focuses on validating the value of the toolkit. The second stage focuses on further development of the toolkit and the way Idean use visual thinking in their practice. In the third stage, the focus is on helping other organizations implement visual thinking practices.

The first stage starts with distributing the toolkit and informing the designers at Idean of what it is and how it can be used.

After this the designers that have an interest in using the toolkit are invited to take part in pilot test. In the pilot test these designers will use the toolkit in workshops and as they otherwise see fit for a period of time. At the end of the pilot test period, insights about the value, the drawbacks and the potential of the toolkit are gathered, laying the foundation for the second stage.

At the end of the first stage, the ambition is that a small group from Idean will have gained control over and a positive attitude towards sketching.

If the results from the pilot test are positive, and the value of the toolkit is validated, the recommendation is for Idean to set up a visual thinking lab. At Idean, a "lab" is an internal project that focuses on developing a specific part of Idean's practice. The lab is run by ambassadors at their different studios who are responsible for developing and implementing the practice at the studio.

The lab should develop Idean's visual thinking practices further, going beyond the toolkit and remote collaboration. This would include visual thinking practices in face to face collaboration as well as individual practice.

The lab should develop practices that are specified to the different services that Idean provide, such as user experience design, user interface design and service design. This is in order to capitalize on the value of visual thinking within all of the services that Idean provide.

The lab should work in an agile manner, meaning that there should be a short loop between the development of practices by the ambassadors and use by other Idean employees.

At the end of stage two the ambition is that Idean has developed visual thinking practices that are valuable for all of the services that they provide and which are used by the majority of the designers at Idean. This would mean that there is widespread control, positive attitude and positive norms towards sketching at Idean.

During stage two the visual thinking practices that are developed won't be used solely by Idean, but also by their clients when collaborating with Idean. Through this use, the attitude of their clients should also start to shift towards having a positive attitude towards sketching. With this, opportunities of implementing visual thinking practices within client organizations might arise.

In stage three, Idean seizes these potential opportunities, by developing visual thinking practices within client organizations.

This should start with mapping the needs, potential and resistance that there could be in the client organization, as these might be very different from what has been experiences at Idean in stage two.

Thereafter a pilot project should be set up at the client organization and a new toolkit should be developed that is tailored to the practice of the client organization.
At the end of stage three the ambition is that the control, attitude and norms should be positive both at Idean, and in the organizations that Idean develops visual thinking practices for.

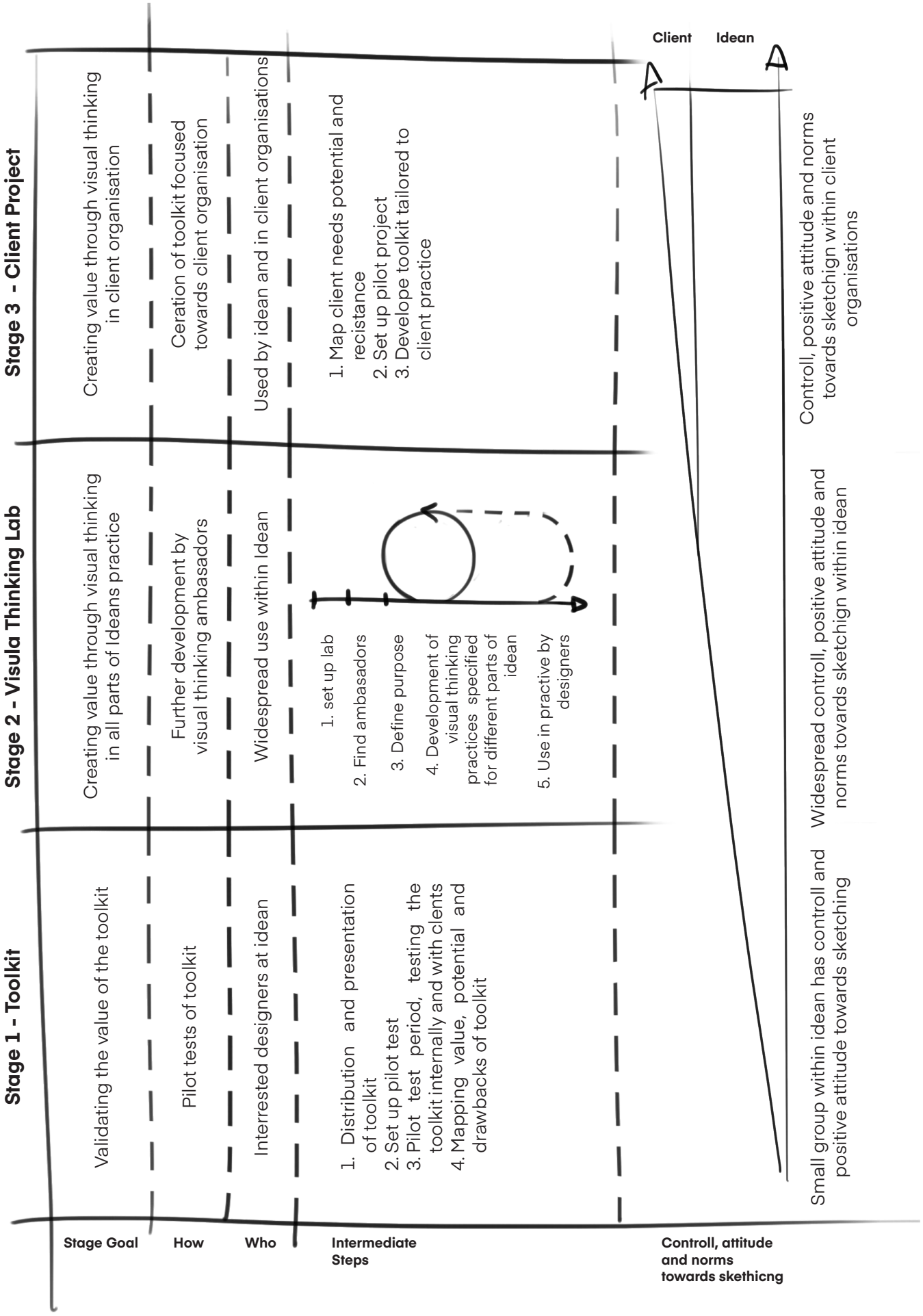
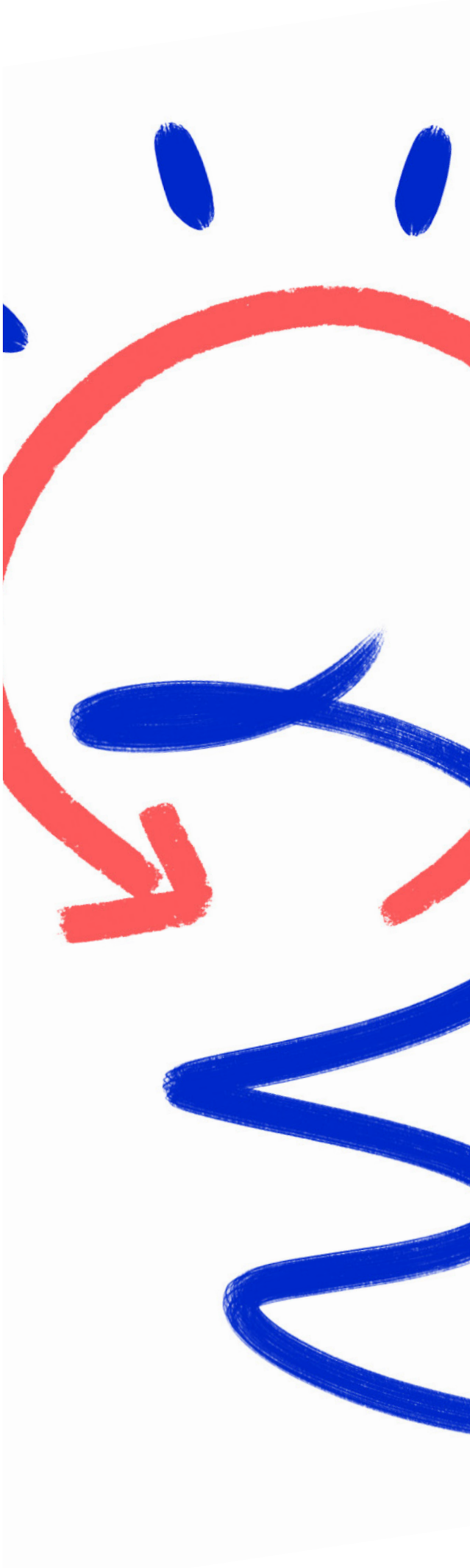


Figure 64. Implementation plan



7 Conclusion

The purpose of this project was to enable Idean to use sketching in their remote workshops. This was done with the intention that sketching could strengthen their workshops by supporting active participation, communication and shared creation.

The project achieves this purpose by providing the designers at Idean with a toolkit that gives them the control over how to use sketching in remote workshops, ensuring that they know when, how and what to sketch in the workshops, in addition to ensuring that the way of sketching is aligned with the abilities of the participants.

The toolkit provides a structure for using sketching in remote workshops that takes into account iCPS, remote collaboration, Idean's practice and the theory of planned behaviour. The toolkit covers sketching activities, a method for creating and collaborating with sketches, how to structure the activities, sketching instructions and how to capture the value of the activities for use later in the projects. These elements create a foundation for using sketching in remote collaboration and cover the most important aspects of including sketching in remote workshops.

The sketching cheat sheet and the warmup activity gives the participants control over their sketching abilities. The analogue first method and the activities ensures that sketching will create valuable outcomes in the workshop. The layout of the activities structures the activities, so that they can be executed successfully. Finally the visual reasoning canvas ensures that the valuable outcomes from the activities will be captured and used beyond the workshop.

The toolkit is seen as providing a good foundation for using sketching in remote collaboration. However, the activities in the toolkit are mainly focused on sketching situations with people, which is not the only valuable way to use sketching in remote workshops. Therefore, there is a need to develop of more activities that use other ways of sketching such as making schematic representations of systems or metaphorical representations of abstract ideas. The toolkit facilitates this by providing the analogue first method, from which more activities can be developed.

Furthermore, the toolkit has only been tested in workshops that

were set up for the purpose of testing the toolkit. Therefore, there is also a need to test the toolkit further in workshops with clients, to see that it also works in this environment.

The hope for the toolkit is that: a few brave individuals within Idean will adopt the toolkit and develop it further; that they will adapt it to their personal way of working and build on the toolkit with new activities, instructions, methods and ways of using the results, further enhancing the value of the toolkit; that the use of the toolkit within Idean, over time will sway the norms towards sketching in a positive direction, and that it will achieve widespread use within Idean.

Statement from Joachim Svela

Finally, I would like to end with a statement from Joachim Svela, Creative Director of Idean Norway, who was asked to give a comment on the project and its relation to Idean's practice.

> *In our attempt at quantifying the qualitative, we may very well have swung the pendulum too far from our core discipline and ethos as designers, relying too much on verbal communication and the written word as epistemological representations of agreement and joint understanding.*
>
> *In his approach of adding visual reasoning as a strategic layer to the SMC and the way we can facilitate Service Modelling, Harald Eliassen is effectively augmenting both the way we work, how we work and represent design as a discipline in the boardrooms.*
>
> *By reconnecting us with our roots of visual communication as both a method, a means and an end, he is effectively establishing an added way of strategic discussions: Visually identifying, debating, reframing and agreeing on topics that at many times are ephemeral, unarticulated or even tacit. I find his work to be highly strategically valuable and creatively invigorating. Both for us, our partners and our clients.*
>
> *Joachim Svela,*
> *Creative Director: Idean Norway*

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Appendix

Appendix A – Project Changes Due to the Corona Virus Outbreak

The project coincided with the outbreak of the COVID 19 virus in Europe. This outbreak led to severe restrictions and changes to the daily life in most European countries. Among these changes were that universities closed their campuses and companies had their employees working from home. This was also the case for the two parties involved in the project, TU Delft and Idean.

The project was originally planned to focus on face to face workshops. This, however, suddenly became an unsuitable topic, as there was no chance to observe or test solutions within face to face workshops, as none of these were conducted any more. Because of this, the best option was to change the focus of the project towards remote collaboration. Since all the teams at Idean had suddenly become remote, and there were better opportunities of observations and tests within this domain. In addition to this, the change of focus towards remote collaboration, made the project a lot more relevant for Idean, and the creative industry as a whole, as this was a change that everyone was facing at that moment.

On a personal level the Covid-19 pandemic brought with it the challenge of having to work from home, in isolation and not being able to discuss the project with fellow students, supervisors and company mentors.

Sketching for Remote Collaboration

Toolkit

Contents

Sketching Basics

Materials

For the type of sketching that is presented in this toolkit, simple sketching materials are sufficient. Most types og pens, pencils, markers and paper will do.

The most optimal materials are:

- A4 printer paper
- Black felt tip marker

Alternative materials are:

- Ballpoint pen
- Fineliner
- Pencil
- Notebook
- Legal pad

The most important thing when it comes to materials is that the pen makes a clear mark on the paper that is easy to read.

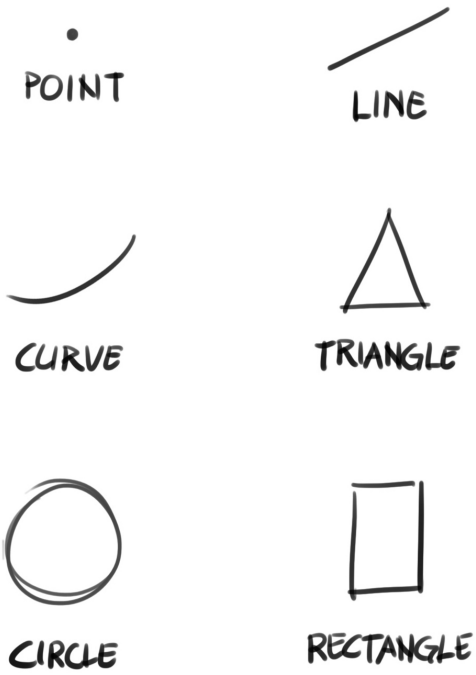
The Visual Alphabet

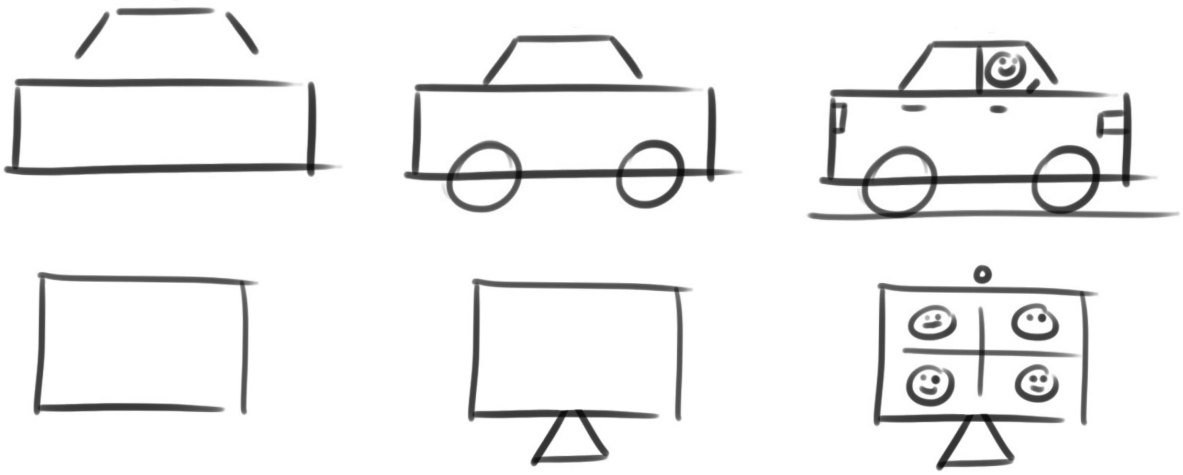
Everything you want to draw, can be constructed with a few basic elements.

These elements are:

- Point
- Line
- Curve
- Rectangle
- Triangle
- Circle

When sketching something it is helpful to think of which of these elements you need to use to Illustrate something.





Sketching Objects
Start with the biggest volume of the thing you are going to sketch. Is it one of the elements, or a combination of the elements?

Once you've sketched the biggest volume, add the medium sized volumes. This can be things that are placed within the volume or things that exist in connection with the volume. Use the five elements to sketch these details as well.

Finally add the small essential details that will make the object unmistakable.

People

People are useful to include in drawings as we are usually designing for a user, who is a human being.

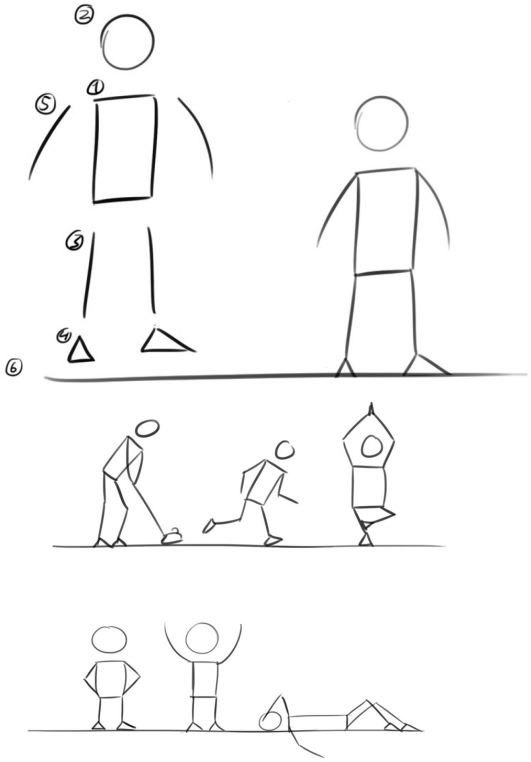
Humans can also be sketched using the elements from the visual alphabet.

Torso
The torso is the biggest volume on a human body. Start by sketching a rectangle for the torso.

Head
A circle on top of the rectangle represents the head.

Arms and Legs
Lines at each corner of the rectangle represent the arms and legs.

By playing around with these different shapes you can depict people doing different actions such as running, doing yoga, or playing golf.



Faces

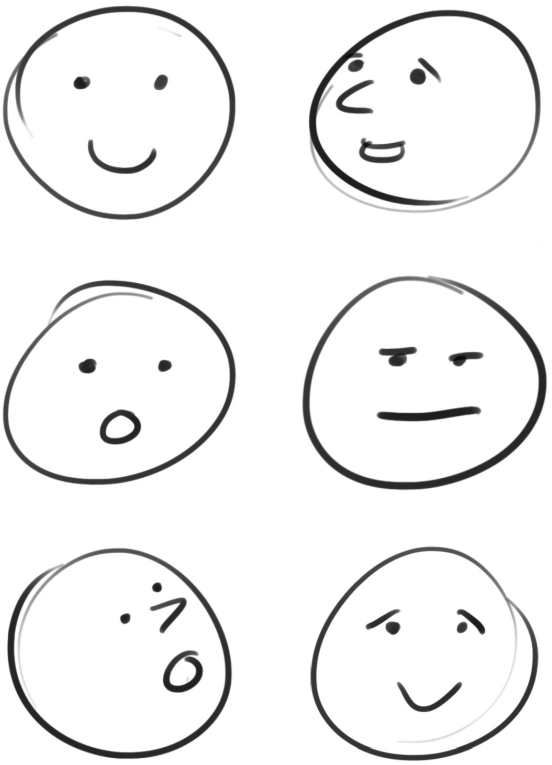
Faces are good for showing human emotion, in addition to the direction of the head. The elements we can use for drawing faces are eyes, eyebrows, the nose and the mouth.

Eyes eyebrows and mouth
The eyes, eyebrows and the mouth are useful for showing emotions.

Playing around with the direction and the shape of the mouth and the eyebrows, you'll quickly see the different emotions that are conveyed on the persons face.

Nose
The nose is useful for showing the direction of the head. The direction that the tip of the nose is pointing is also the direction that the head is facing.

Use of elements
There is no need to always use all the elements in a face. You only need to use the ones that have a purpose for that sketch.

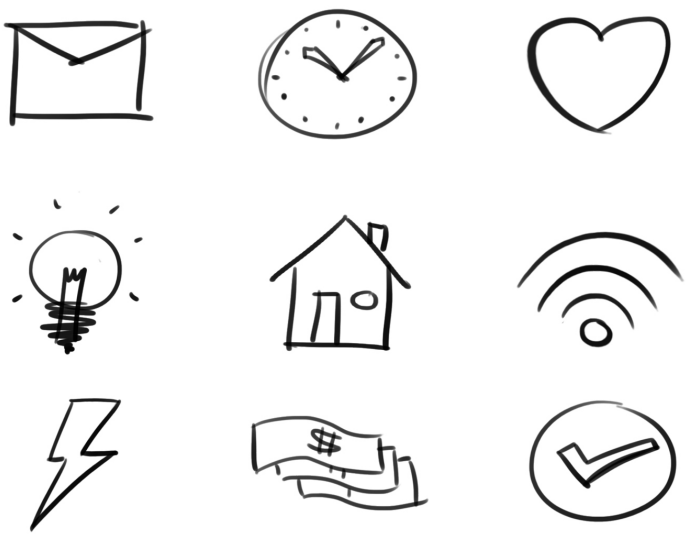


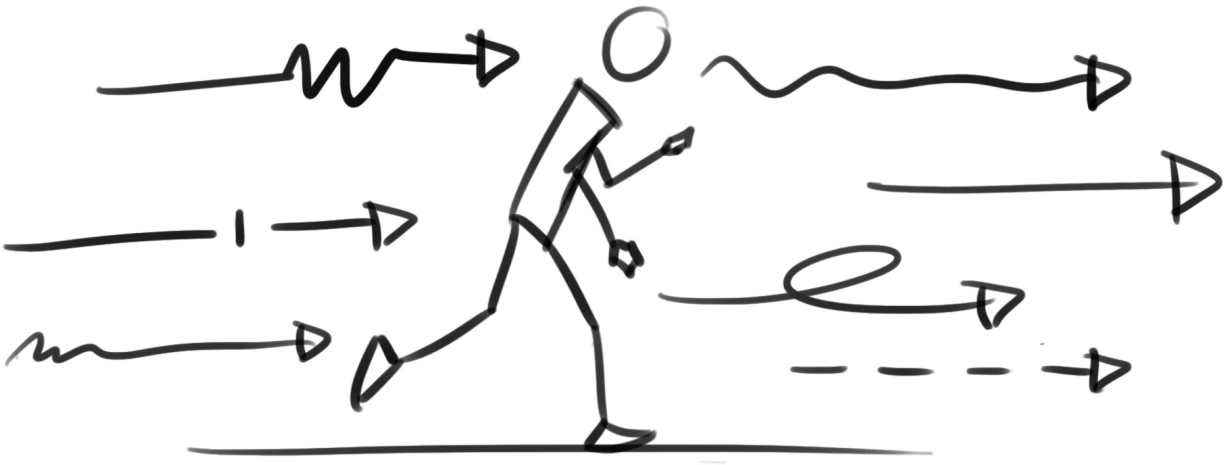
Icons

Icons are something we see all around us, and that are understood by most people.

Icons can be helpful to add to sketches to convey different meanings. A clock means there is a relation to time, a heart means that the emotion of love is present, a checkmark means that something is finished, and a lightbulb means that there is an idea present.

Including simple icons in your sketches can give more meaning to and better understanding of what the sketches are depicting.





Arrows

Arrows can show connections between elements and movement.

You can experiment with different lines, dotted, squiggly, circular, etc. to give the arrows different meanings.

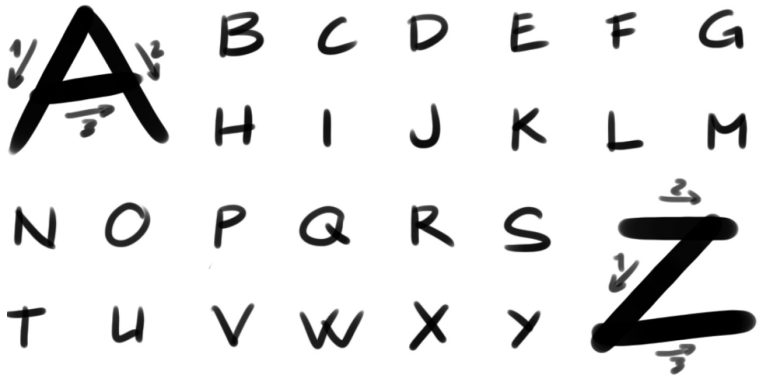
Text

Text is useful for giving specific information that can be hard to convey through sketches, as well as helping your audience understand what is depicted.

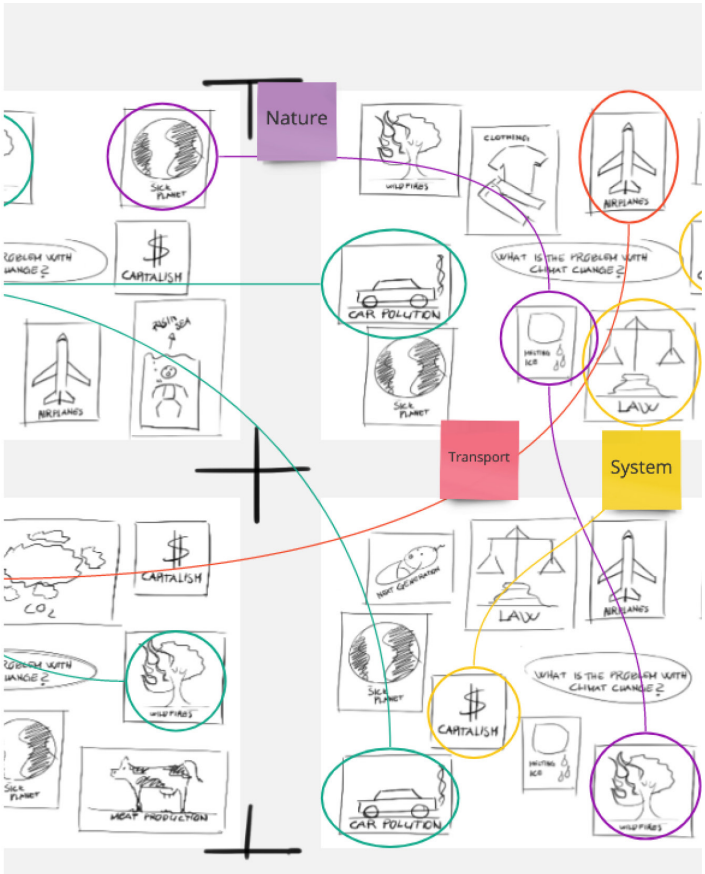
How to use it
Numeric information, titles, speech and annotations are best conveyed in textual form. When using text in sketches, it should be limited to single words or short sentences, and the text should be clear and easily readable.

Architecture typography
To develop a clear handwriting to use in your sketches, architecture typography is a good place to find inspiration. They use only capital and short wide letters, which make the text very clear and easy to read.

To achieve this handwriting, try to fit each letter into an imaginary square, and draw each letter from the top and down, always starting with the most vertical lines of the character and finish with horizontal lines and curves.



Method & Activities



Method for Sketching in a Remote Context

In order to use sketches in remote workshops, we need a structured method for how to make and collaborate around sketches in remote workshops.

In short
The method is to first have the participants sketch individually with pen and paper. Then they upload pictures of the sketches to the digital whiteboard. Lastly, they use the digital whiteboard to collaborate around the sketches.

This method is the foundation for all the activities in the toolkit. This means that all of the activities in the toolkit follow the same basic steps that are presented in this method.

Step by Step

1. First the participants sketch with pen and paper on their own.
2. Once the sketches are finished, the participants take photos of their drawings using their mobile phones.
3. The photos are uploaded to the digital whiteboard.
4. Once all the sketches are uploaded to the digital whiteboard, the participants collaborate around the sketches.

Templates
Every exercise has a template that structures the sketches. The purpose of the templates is to ensure that the sketches are clear and that they are comparable between the participants.

Uploading
The participants can find their own workflow for uploading the pictures. Most participants are able to figure this out on their own. Using airdrop(mac) or bluetooth sharing (android) are good and easy options.

Collaborating
What the collaboration entails, depends on the activity, and varies between mapping out similarities and differences between sketches, to presenting concepts to the other participants.

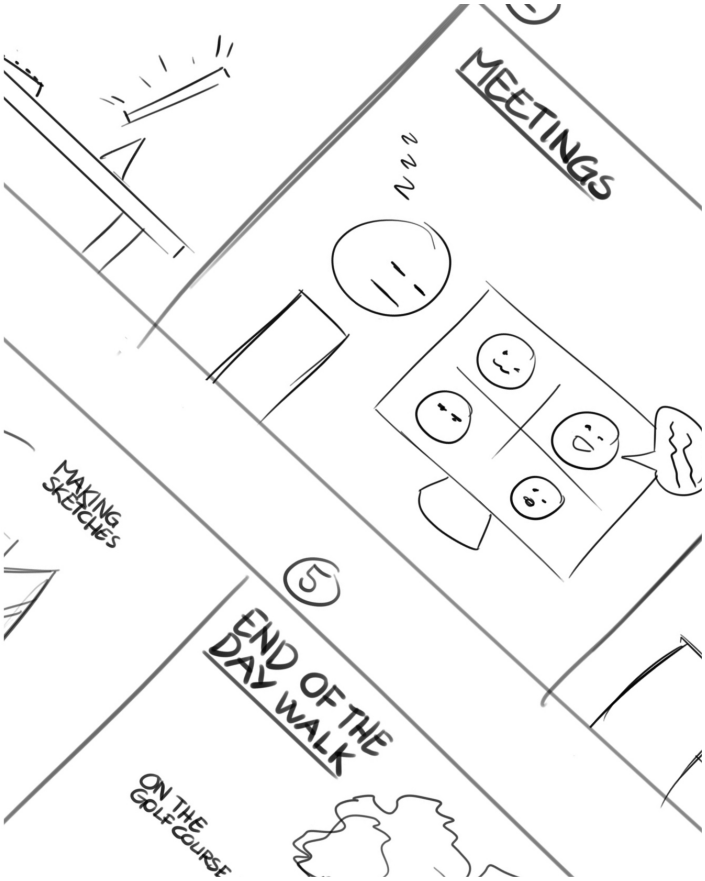
Copy Journey

Time	**10 min**
Type of activity	**Warmup**
Used for	**Warming up sketching skills**

Purpose
The purpose of the Copy Journey activity is to warm up the sketching of the participants so that they won't hesitate to sketch in later exercises.

The activity lets the participants become familiar with the visual alphabet. At the same time, they become familiar with the workflow of the sketching activities. Finally the activity can also be used to have the participants start thinking about the theme of the workshop.

In Short
The participants are shown a user journey for a specific situation, that has already been sketched. The participants copy a sketch of a user journey onto their own paper. The participants alter the sketch where it doesn't fit their perception of the user journey. The sketches are photographed and uploaded to the digital whiteboard and finally the participants mark the most interesting moment in the journey.



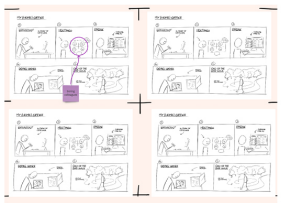
Step by Step

1. Sketch – 12 min
Copy the given journey onto your own paper, alter the situations if you have another view of the situation. Don't make it too complicated - the main purpose is to become familiar with the way of sketching.

2. Upload – 3 min
Take a picture of your sketch, upload it to the digital whiteboard and place it within the Copy Journey frame in the digital whiteboard.

3. Test whiteboard tools
Use the shape tool to make a circle around the most interesting moment in the journey. Place a sticky note underneath this moment and write down a keyword that explains this moment in the journey. Use the arrow tool to connect the sticky note and the circle.

After the activity any initial hesitation to sketch should be gone. The participants should be more familiar with the sketching alphabet and should have become more familiar with the theme of the workshop. They should now be ready to move on to other sketching activities.



Picture the Problem

Time	**25 min**
Type of activity	**Problem finding**
Use for	**Finding different aspects of a problem**

Purpose
The purpose of Picture the Problem is to explore different aspects of a problem, so that the group can get a shared understanding of which problem they are going to tackle.

In short
Picture the Problem is done by first having the participants individually sketch different aspects of a given problem. The individual sketches are thereafter uploaded to a digital whiteboard. There the participants map out patterns and relationships that they find between the individual sketches. When the mapping is finished, the participants look at the insights that they have uncovered and choose one or more directions on which to focus their attention on.

Step by step

1. Sketch – 12 min
Write the question in the middle of the page and start sketching the different aspects of the problem. By asking yourself "Why?" and "What else?", you will find many different aspects of the problem.

Write down a keyword and draw a frame around each aspect, to clarify what it is and to separate it from the other sketches.

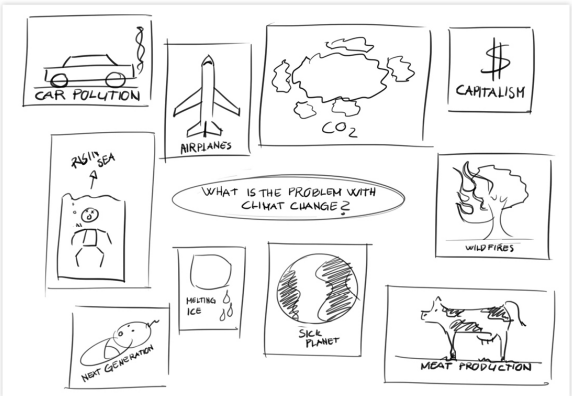
Fill the paper with small sketches, but don't make connections between the sketches yet.

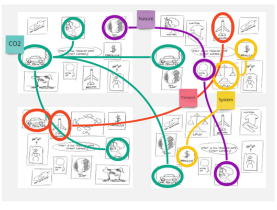
2. Upload – 3 min
Take a picture of your sketch, upload it to the digital whiteboard and place it within the picture the problem frame in the digital whiteboard.

3. Mapping - 10 min
With the other participants, discuss which themes, similarities or contradictions you see in the different aspects that are sketched.

Start mapping the insights you find, by making circles around the sketches and drawing lines between them. Add a sticky note with a keyword that explains the insight that is found.

After the activity, the group should have a better understanding of the problem and have several starting points for tackling the problem.



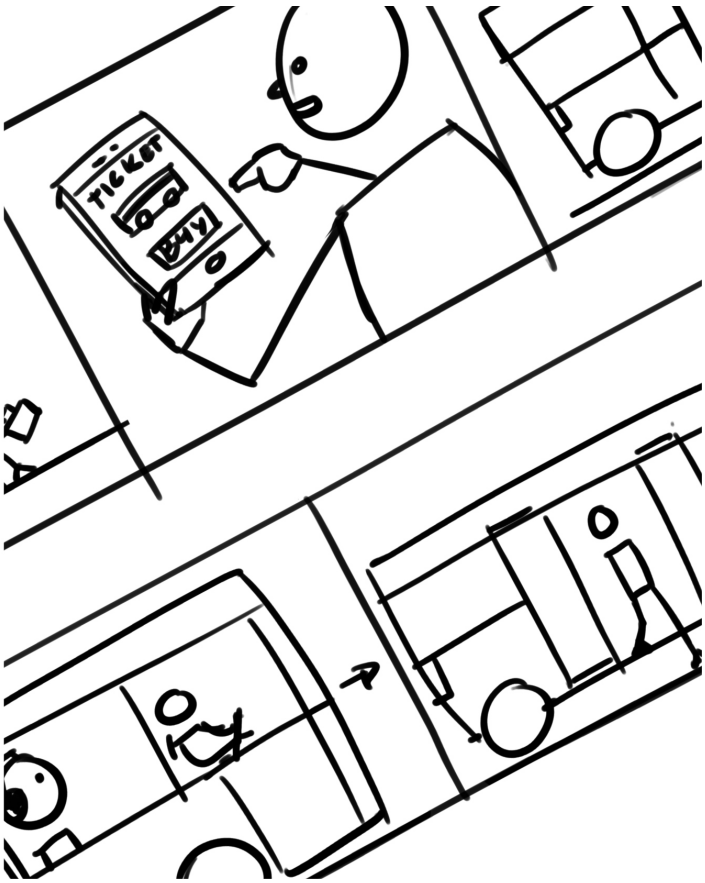


User Journey

Time	**25 min**
Type of activity	**Discover**
Use for	**Diverging**

Purpose
The purpose of the User Journey activity is to uncover different perspectives of a user journey, leading to shared understanding and a holistic view of the journey.

In short
In this activity the team members individually sketch the given user journey as they see it. Afterwards they compare their journeys and mark the patterns that emerge between the journeys. This gives them an awareness of the most important aspects of the journey, that they can use as a starting point for other activities.



Step by Step

1. Sketch – 12 min
Individually sketch the given user journey as you perceive it.

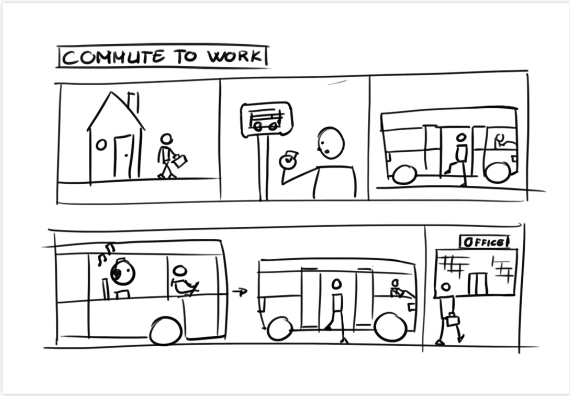
- Sketch the journey in clear steps, separating each step with a frame.
- The Journey can be sketched on two lines and cropped into one in the digital whiteboard.
- Centre the journey around the user. Think of what the goal of the journey is, and which steps the user needs to take to achieve it.

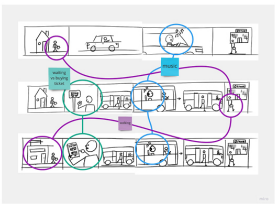
2. Upload – 3 min
Take a picture of your sketch, upload it to the digital whiteboard, and place it within the journey map frame in the digital whiteboard.

3. Mapping - 10 min
With the other participants, discuss which themes, similarities or contradictions you see in the different journeys that are sketched.

Start mapping the insights you find, by making circles around the sketches and drawing lines between them. Add a sticky note with a keyword that explains the insight that is found.

After the exercise the team should have a better understanding of the different perspectives of the given user journey. From here the team can decide on a specific area of the user journey that they want to focus on further



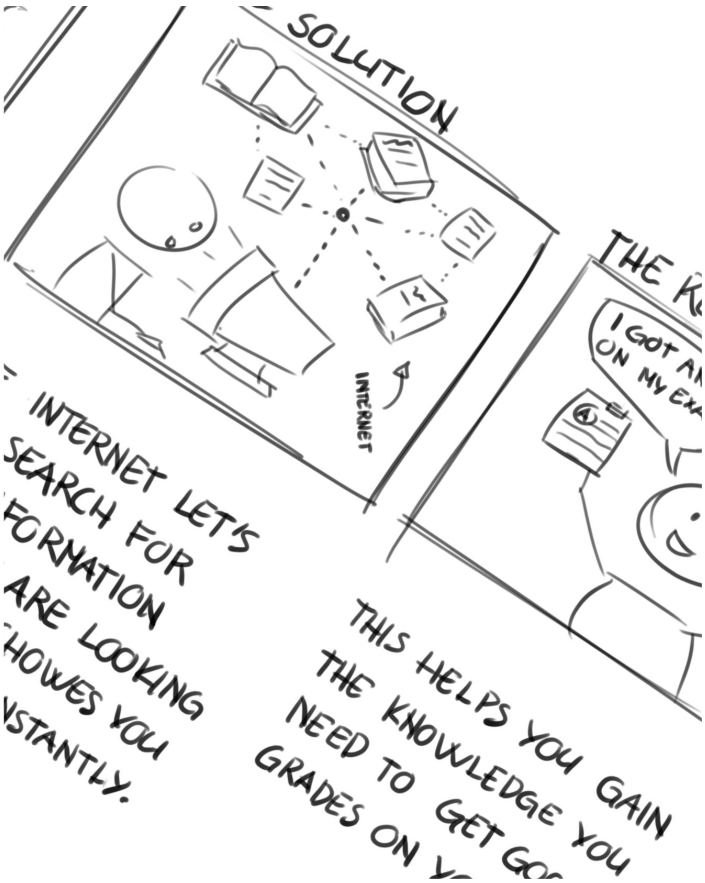


Storyboarding

Time	**25 min**
Type of activity	**Solution finding**
Use for	**Developing ideas into solutions**

Purpose
The purpose of the storyboarding exercise is to explain the full story of a concept. This is done visually, so that others can understand it more easily.

In short
The participants individually sketch their concepts by following a template. The template has three frames where the participants sketch the problem, the solution and the result. The sketches are uploaded to the digital whiteboard, and each participant breifly presents the concept to the rest of the team.



Step by Step

1. Sketch - 12 min
Copy the Storyboarding template onto your own paper.

- Write the name of the solution in the top left-hand corner.
- Write "The Problem" on top of the first frame, "The Solution" on top of the second frame and "The Result" on top of the third frame.

In the first frame, draw the situation where the user faces the problem. Under the frame write a sentence explaining the problem.

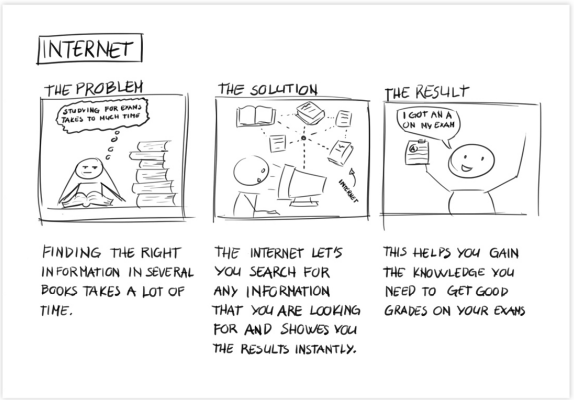
In the second frame, draw the solution to the problem. Under the frame write a sentence explaining the solution.

In the third frame draw how the solution has impacted the user's life and what emotion is attached to this. Under the frame write a sentence explaining the result.

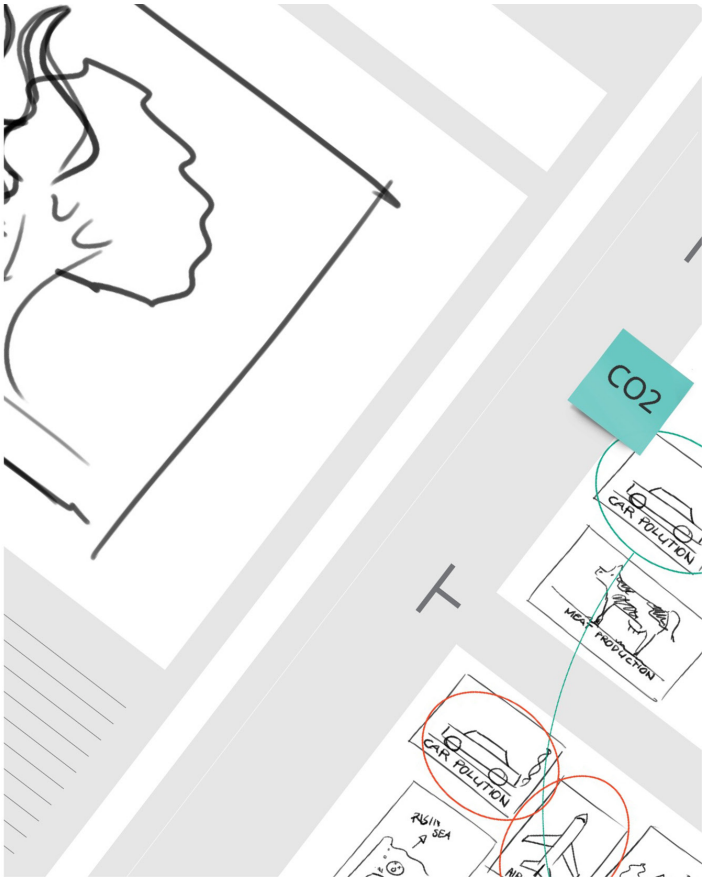
2. Upload – 3 min
Take a picture of your sketch, upload it to the digital whiteboard and place it within the Storyboarding frame in the digital whiteboard.

3. Present – 2,5 min per solution
Present the storyboards to the group and discuss the different storyboards.

After this activity the group should have a clear view of different solutions to the problem they are working on. The activity can be finished by choosing one or more solutions to focus further on.



Visual Reasoning Canvas

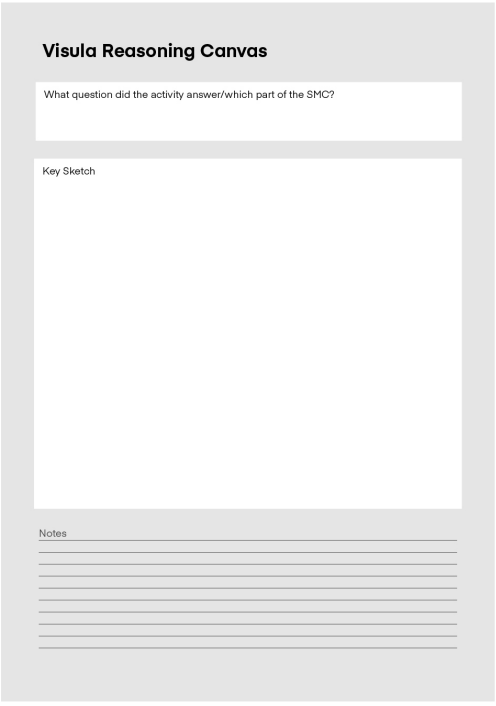


The Visual Reasoning Canvas is used for determining which insights the team wants to bring with them from an activity.

The purpose of the canvas is to make the whole team aware of which decisions are being made, and where the collective focus of the team is. In addition to this, the canvas can be used after the workshop to recall what the most important insights were and where they came from.

In short
At the end of an activity, the most influential sketch or sketches from the activity are copied and pasted into the canvas and a short explanation is written down underneath. At the top of the canvas which activity the canvas belongs to and which question the activity tries to answer is written down.

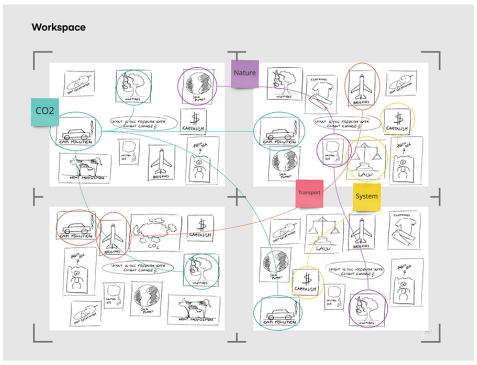
In combination with the Service Model Canvas
The visual reasoning canvas can be used in combination with the Service Model Canvas, as a visual addition. In these cases, the top field is instead filled out with the section from the service model canvas that the visual reasoning canvas should influence.



Step by Step

1. While setting up the digital whiteboard for an activity, place the visual reasoning canvas next to the activity workspace.
2. In the visual reasoning canvas, write down which activity it belongs to and what question the activity is attempting to answer.
    - Alternatively, which section(s) of the Service Model Canvas the different activities are supposed to influence.
5. After each activity, have the team determine which insight they want to bring with them from the activity.
6. Copy and paste sketches that represent this insight into the key sketches frame.
7. Write a short explanation of the insight underneath the sketches.
8. If working with the service model can, fill out the exact formulation of the insight within the specified field in the service model canvas.

By using the visual reasoning template, the decisions that were made during the workshop should be more transparent. You will be able to see the raw content by looking at the activity frame, the key insights that came from the activity in the visual reasoning canvas, and the result of the activity in the Service Model Canvas.



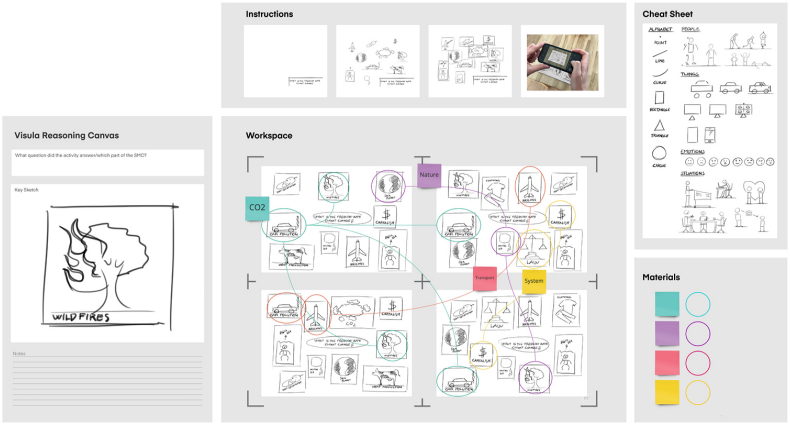
Setup for a Remote Workshop

Workspace

Some preparation of the digital whiteboard is needed before conducting any of the sketching activities. These preparations mainly consist of preparing the space where the participants do the activities, and the components that are supposed to support the activity.

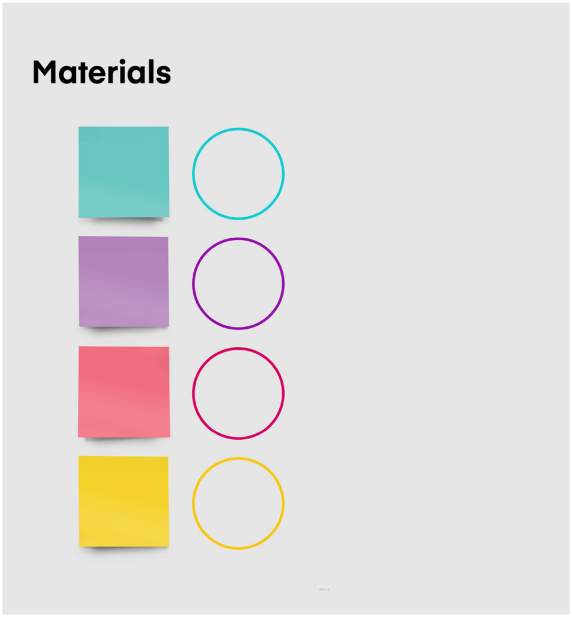
The workspace is placed in the middle. This is where the participants do the collaborative part of the activity. The supporting components will be placed around the workspace.

The only content that should be in this frame before the activity, is a grid where the participants can place their drawings, and potentially a problem statement, if it is applicable to the activity.



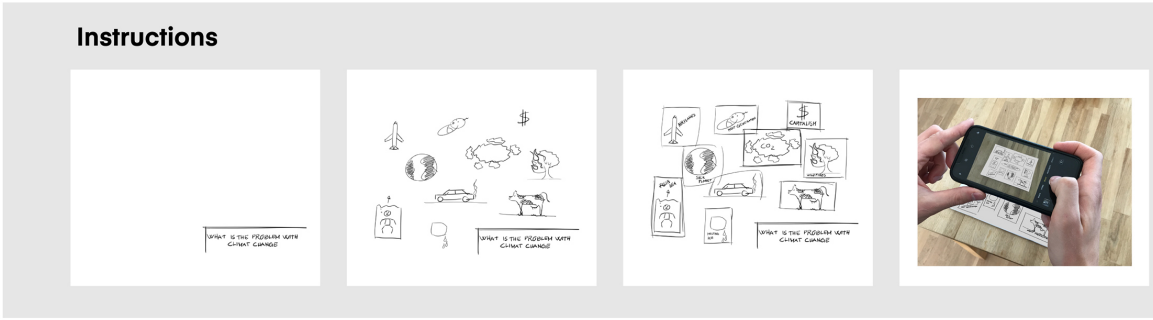
Materials

To the left of the workspace frame, there can be a materials frame. This is a space where materials that are needed for the activity can be placed. Examples of materials could be sticky notes and circles of different colours, or dots for voting. This depends on what is needed for the activity. Not all activities will need materials, in these cases this frame can be taken away.



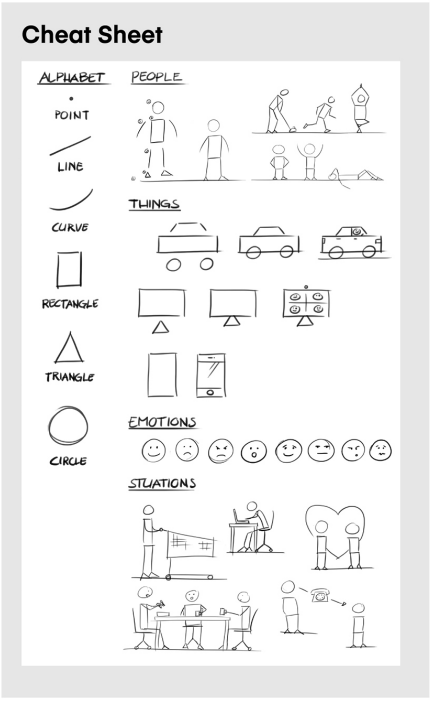
Instructions

The instructions for the activities should be placed above the workspace. The instructions are used at the start of the activity to introduce the activity as well as being a reference for the participants during the activity. When collaborating remotely, there is a higher boundary for verbal communication, therefore it is useful to have instructions accessible at all times, so that the participants can figure out what they are supposed to do, if they get lost during the activity.



Cheat sheet

The sketching cheat sheet can be placed to the left of the instructions. The cheat sheet should be introduced at the start of the workshop and doesn't need to be introduced before each activity. However, it is useful to have the cheat sheet placed alongside each activity so that it is easily accessible for the participants when it is needed as a reference.



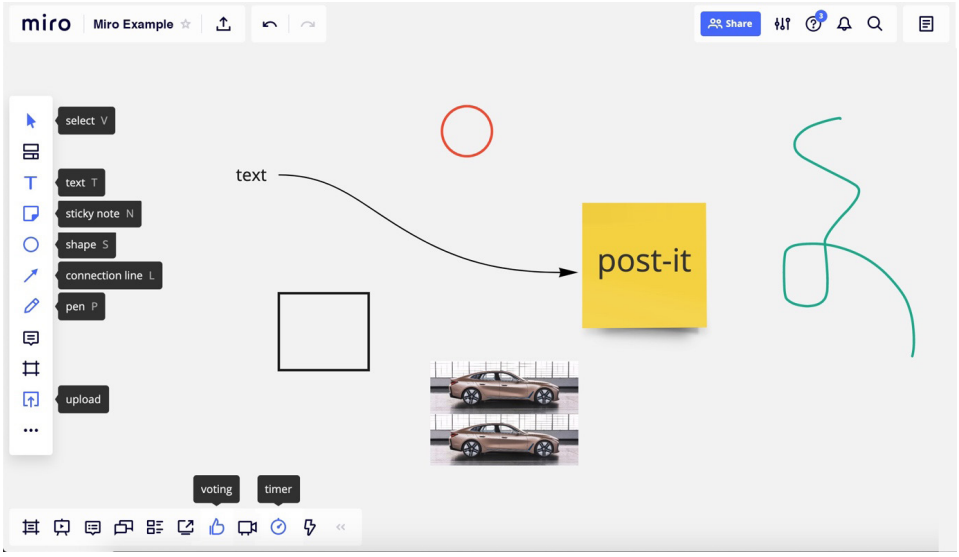
Visual Reasoning

The Visual Reasoning canvas should be placed to the right of the workspace frame. This canvas should be filled out at the end of the exercise and should highlight the most important insights gained from the activity. When returning to the activity after the workshop, to review the insights, the most important insights will then be seen first as the canvas is placed furthest to the right, and the raw material (the workspace) will be seen second, as it is placed to the left.

Appendix C – Digital tools for remote collaboration

In Idean's remote workshops they use the digital whiteboard tool *Miro*. This is one of the many digital whiteboard tools that are available online. A digital whiteboard such as Miro, is the viritual context where the remote workshops are conducted. Before looking at how to collaborate around skethces in this context, it is important to understand the context itself, how these digital whiteboards work and what functions they provide.

Although Idean uses Miro for their remote workshops, there are numerous other digital whiteboards available online that all provide similar functionality, for example *Mural, Invision Freehand* and *Hoylu*. The tools have different levels of functionality. However, the main feature of all of them is that several people can join in and collaborate in the tool at the same time. All of the tools have a workspace, that the participants can move around in and generate content. When one participant puts something in the workspace all of the other participants can see it instantly. All of the tools have functionality that lets the participants write text, place sticky note, draw with a pen and upload pictures. In addition, the more advanced tools such as Miro and Mural, also have functions that let you draw shapes, arrows, start timers, place icons, vote on options and much more. In general, there are small variations between the tools, with each one placing the emphasis on different functionalities. Miro for example also has third party plugins that can be installed. However, going into these advanced functions is seen to have little purpose. As we saw in the workshop observation, the tools and skill level of the workshop has to be simple in order for the participants to be able to execute the activities.



Appendix D – Activities Test Instructions

Elevator pitch

Introduction
Hi, Thanks for taking the time to help me out with my project.

You are going to be testing an exercise for explaining your ideas visually

To avoid spending time on figuring out a brilliant Idea, I'll give you an Idea that you will use. Imagine the world before there were cellphones. Now congratulations you're the inventor of the cellphone, and that is the big idea that you will explain.

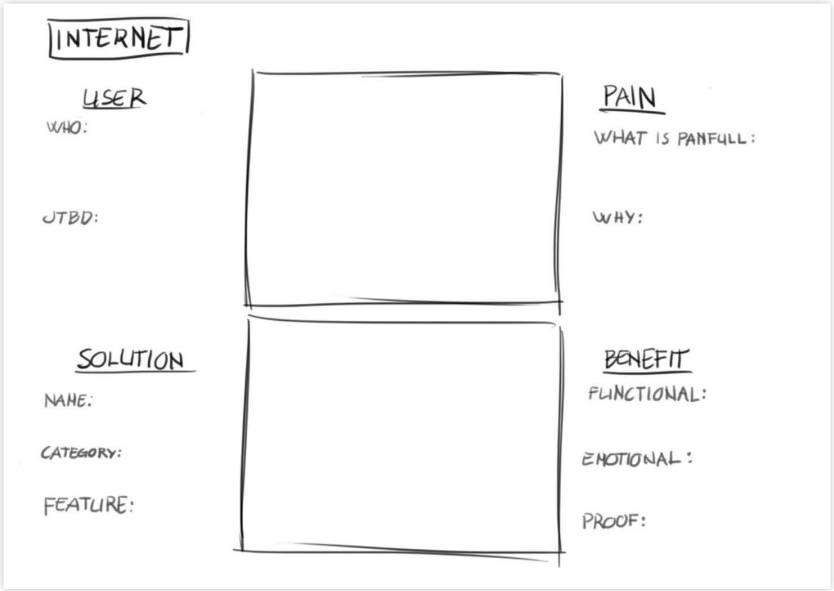
Your task is to make a visual that can be used for an elevator pitch, presenting the idea. There is a template for the visual and the steps will be explained in more detail below.

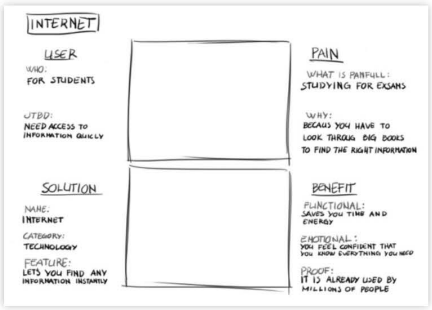
This would be an exercise to use towards the end of a workshop to refine and explain ideas, but that could also be used in other settings where you need to pitch an idea to someone.

Before you start you need to find a piece of paper and something to draw with. Preferably a4 or a3, and a dark pen that is easy to see on the paper

Instructions
1. Copy the template onto your own piece of paper.
    a. Write the name of your idea in the top left corner.
    b. In the middle of the paper draw two rectangles, but leav som room for text on the sides
    c. To the left of the upper rectangle, write "user". Under "User" write: "Who" and "JTBD" (Job to be done).
    d. To the right of the upper rectangle write "Pain". Under "Pain" write "what is painfull" and "Why"
    e. To the left of the lower rectangle, write "Solution". Under "Solution", write "Name", "Category" and "Feature".
    f. To the right of the lower rectangle, write "Benefit". Under "Benefit", write "Functional", "Emotional" and "Proof".

ⓘ In the example the idea that is being pitched is the internet, instead of a cellphone. Don't let this confuse you, your pitch should still be for the idea of a cellphone.





2. Now fill out the template.

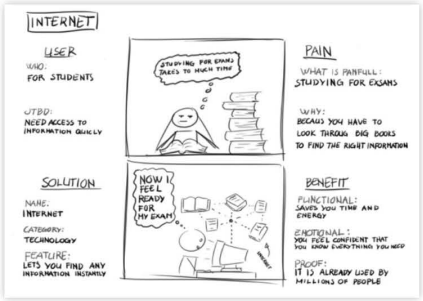
a. Under User, write who the user is and what the job to be done is,

b. Under Pain, write what is painfull about the current situation and why it is painfull.

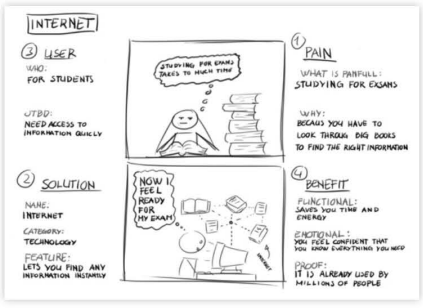
c. Under solution, write the name of the solution, the category the solution falls within and what the main feature of the solution is.

d. Under Benefit, write the functional benefit of the solution, the emotional benefit of the solution and any proof you have that the solution is a good one.

3. Now draw the user experiencing the painful situation in the top rectangle



4. Finally in the bottom rectangle draw the user in the new situation, with the solution.



5. For pitching the solution, you can start in any corner, and move around the template, but it might be good to plan what goes first and what goes last. Think about what order you want to present the information, and number the corners from 1 to 4. For the example, you could first present the pain, then the solution, followed by the user and finally the benefit. Then the pitch would go something like this:
"Studying for exams is painfull, because you have to look through big books to find the right information. The solution to this is a technology that lets you find any information instantly, it's called the Internet. It is for students that need access to information quickly. It's already used by millions of people. it saves them time and energy, and they feel confident that they know everything they need.

6. Write the approximate amount of time you spent, in the top left corner.

7. Take a picture of the drawing and send it to Harald Eliassen on Slack or by email to haraldeliassen@idean.com, and pleas include any comments or questions you might have about the exercise.

That's it for this test, good job and thanks for helping!

Story Boarding

Introduction
Hi, Thanks for taking the time to help me out with my project.

You are going to be testing an exercise for explaining your ideas visually

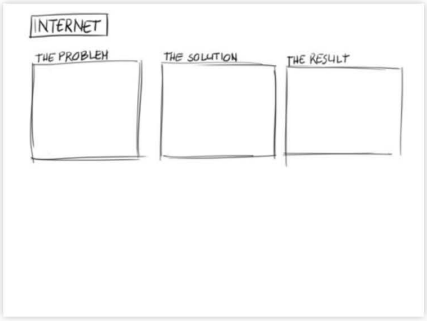
To avoid spending time on figuring out a brilliant Idea, I'll give you an Idea that you will use. Imagine the world before there were cellphones. Now congratulations you're the inventor of the cellphone, and that is the big idea that you will explain.

Your task is to draw a storyboard that explains the problem with not having a cellphone, the solution that the cellphone is, and what the result of having a cellphone is. If it's unclear, the steps will be explained in more detail below.

This would be an exercise to use towards the end of a workshop to refine and explain ideas, but that could also be used in other settings where you need to clarify and explain an idea to someone.

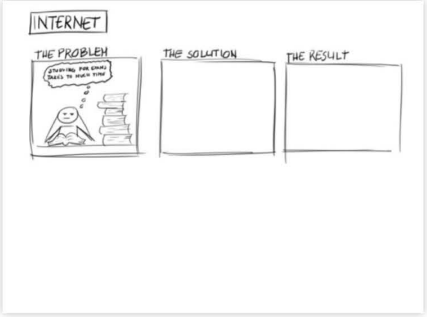
Before you start you need to find a piece of paper and something to draw with. Preferably a4 or a3, and a dark pen that is easy to see on the paper.

> In the example the idea that is being pitched is the internet, instead of a cellphone. Don't let this confuse you, your pitch should still be for the idea of a cellphone.

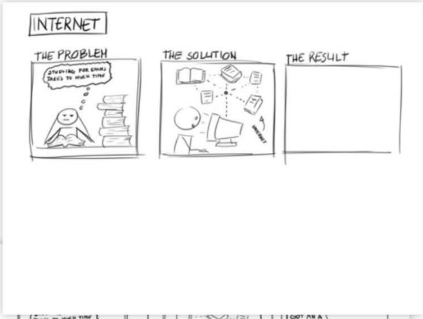


Instruksjons

1. Copy the template onto your own piece of paper.
   a. Draw three frames on the upper half of the paper.
   b. Write "the problem" over the first frame.
   c. Write "the solution" over the second frame.
   d. Write "the result" over the third frame.
   e. Leave some room under each frame for explanatory text

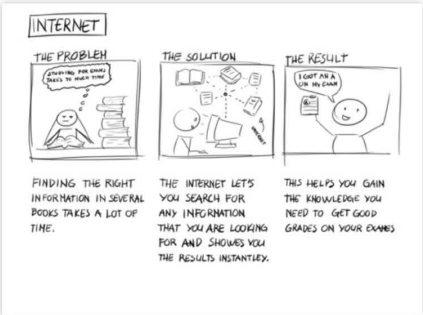


2. In the first frame, draw the situation, e.g. a problem that the user faces by not having a cellphone.



3. In the second frame draw the solution to this frustration. E.g. how the cellphone solves the user's problem.

4. In the third frame draw how the solution has impacted their life and what emotion is attached to this.



5. Under each frame you can shortly write what is depicted in each frame.

6. Write the approximate amount of time you spent, in the top left corner.

7. Take a picture of the drawing and send it to Harald Eliassen on Slack or by email to haraldeliassen@idean.com, and pleas include any comments or questions you might have about the exercise.

That's it for this test, good job and thanks for helping!

Picture the problem

Introduction
Hi, Thanks for taking the time to help me out with my project.

You are going to be testing an exercise for mapping different aspects of a complex problem. Since you are testing individually, you will only be doing the first individual part of the exercise.

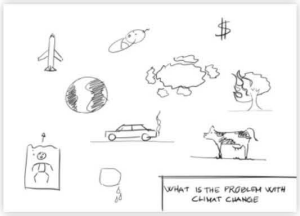
The exercise is to draw different aspects of a problem, in a mind map like fashion so that complexity is uncovered, and patterns and relationships can be found.

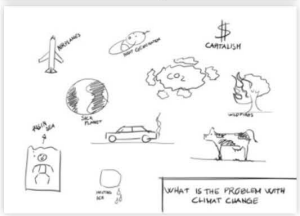
This would be an exercise to use in the start of a workshop or project in order to find the "right" problem to work on.

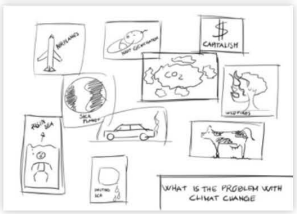
Before you start you need to find a piece of paper and something to draw with. Preferably a4 or a3, and a dark pen that is easy to see on the paper.

Instructions
The complex problem that you are going to try to map is the problem of the corona virus. The task is to make small drawings that represents different aspects this problem. There are no right or wrong answers, anything you find relevant should be included.

1. 

2. 

3. 

4. 

1. In the lower right corner write the question "What is the Problem with the Corona Virus?"

2. Start sketching the different aspects of the problem. Think of:
    a. What you think the core problem is.
    b. New problems that occur because of the core problem.
    c. Things that are affected by of the problem.

3. If you want to clarify the different drawings you can write a keyword or two attached to them, but stay away from full sentences.

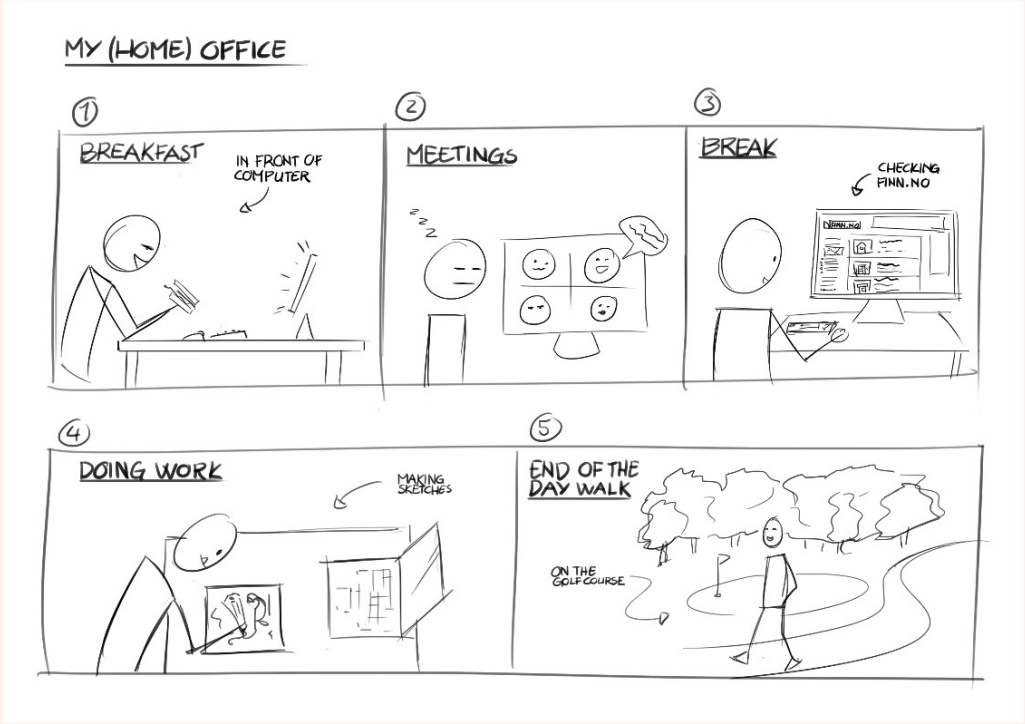
4. Make sure to have some space between your drawings, so that so that it is clear where one drawing starts and ends. You can draw a frame around the individual drawings if this is helps separate the drawings from one another.

5. Write the approximate amount of time you spent, in the top left corner.

6. Take a picture of the drawing and send it to Harald Eliassen on Slack or by email to haraldeliassen@idean.com, and pleas include any comments or questions you might have about the exercise.

That's it for this test, good job and thanks for helping!

Copy Journey



Sketch your workday. Copy the sketches and alter details or the whole situation so that it fits with your workday.

The sketch should show what you do:

1. Before you start working.
2. When interacting with colleagues.
3. In the breaks.
4. When doing work.
5. At the end of the day.

Photograph and upload to the board.

Crop and place in the grid.

Service Model Canvas

What is the name?

What are you making?

Describe the project in one sentence

Who is making it?

Who is in the team and what are their roles?

Why are you doing this?

What is the purpose?

What are the needs of your organization?

What is the desired outcome?

What are the user needs?

Who is the target group(s)?

What are their needs?

What is the value for the user?

Context

Where is the solution to be used?

Obstacles

Possibilities

Conditions

Why is it important?

Who or what initiated this? Why now?

What is your ambition for change?

Incremental:
New market, same service

Disruption:
New market, new service

Existing:
Same market, same service

Innovation:
Same market, new service

Who and what will be affected?

Ecological system: Carbon cycle, ocean, oxygen, nutrients etc.

Industrial system: Logistics, medical, energy, consumer goods etc.

Social system: Language, legal, family, religion, financial etc.

Vision

What is the dream?

Minimal Lovable Product

What will be good enough?

Obstacles

What can keep you from succeeding?

Possibilities

What could support you?

Positive impact

How can they be measured?

Negative impact

How can they be mitigated or avoided?

Success criteria

How can they be measured?

Starting Point

Where do we begin?

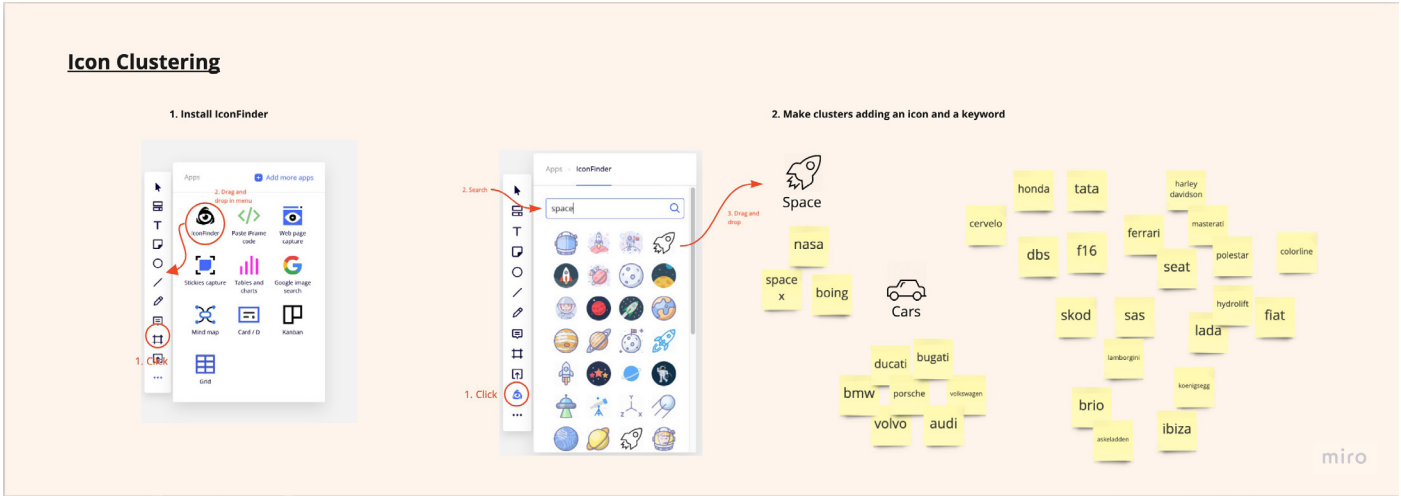
Project stages

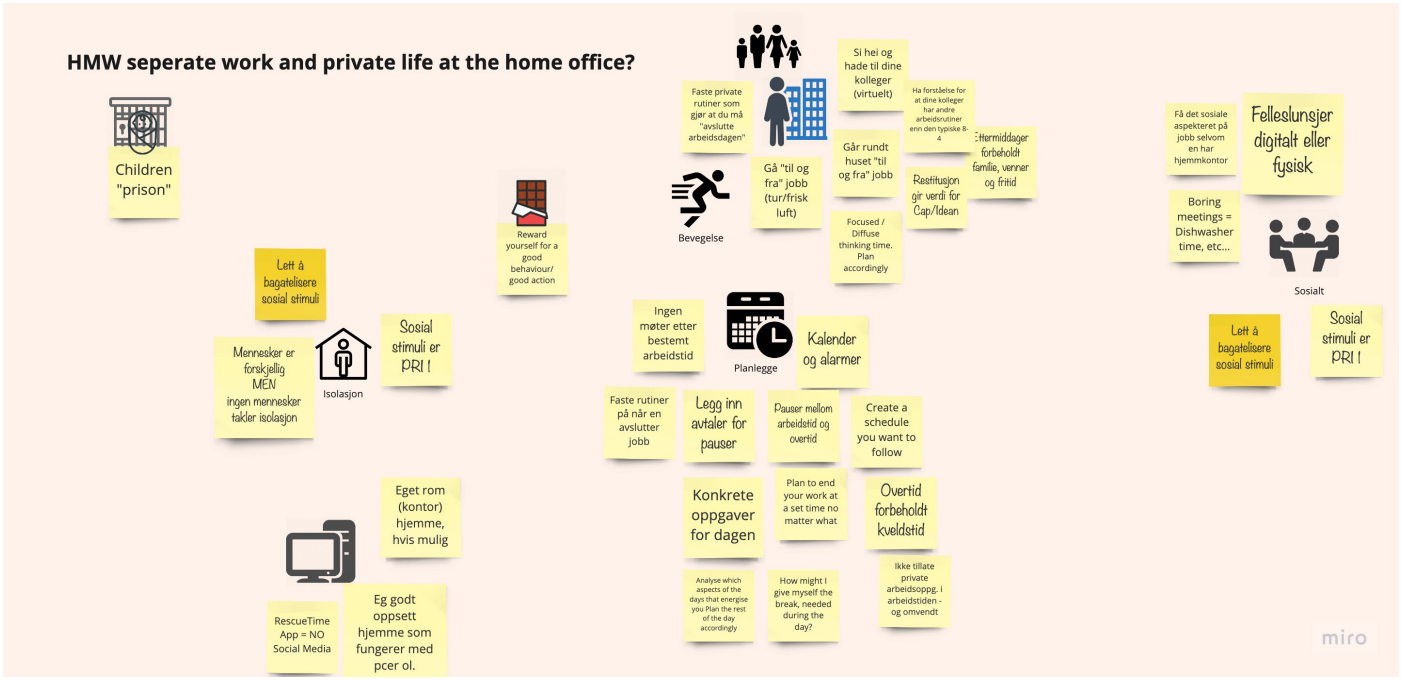
Milestones along the way

Goal

When are we done?

Appendix F – Icon clustering





Sketching for Remote Collaboration

Harald Eliassen 2020