Capturing Creativity

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The design of a toolkit for revergence in creative sessions.

Colophon

Master thesis | September 2018

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Capturing creativity

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Executive Summary

Creative facilitation sessions come to solve the complex problems the world is facing nowadays. Using participants from different work areas to walk through a problem together, these sessions are guided by facilitators. They are the ones expected to bring a creative mindset to the involved people.

LEF Future Center, part of Rijkswaterstaat since 2008, brings a contribution to the power of change and the problem-solving capacity of their stakeholders. They have a set of creative environments to properly stimulate participants during the facilitation sessions. This project, done in combination between TU Delft and LEF Future Center, focuses on supporting participants' creativity during sessions at LEF.

The creative diamond (Guilford, 1950) is the basis approach for facilitation sessions, distinguishing between participants' divergence and convergence thinking. During the first, many ideas are generated, while comes to a final idea/decision when converging. It is common to let participants make use of different means to generate ideas, like whiteboards, sticking notes, and markers. It is known that people might underrate their own creativity, and the facilitators' work is to facilitate participants' creativity. Written, visual and verbal communication is important to let participants express their ideas to each other during sessions.

Besides the classical creative diamond, newer studies have shown the need to differentiate a step in-between the divergence and convergence phases (eg. Tassaul and Buijs; Kaner; Heijne and Smit). It is called revergence and aims to revisit and rearrange every generated idea during the divergence, by making clusters. A literature study was executed to investigate further developments in the creative diamond approach, as well as what influence people's creativity.

At LEF, facilitators let participants generate as many ideas as possible (when diverging), and to come up with a final solution to the indicated problem (when converging). Further investigation with

context observations and interviews with facilitators was performed. It was confirmed that not every facilitator does the converging phase of the session, and that many are not aware of the reverging as a separate stage from converging. In the end, clusters of ideas can be created in a messy mean, leading to deliverables for clients that may not show the full creative potential of the session.

As a way to stimulate participants' generation of ideas and the creation of clusters, the design of the tool thus focuses on supporting facilitators to perform the revergence phase of sessions. Joining findings from both the literature review and context mapping, a promising direction was identified in the use of combination tools for the three phases of the sessions. Using rapid prototyping tests of the tools, a toolkit structure for performing the reverging phase was designed: the Clustalk toolkit.

Ackowledgements

Two years ago I was leaving Brazil and also leaving behind a big piece of me. This is my last work for my Master, and also the most important one. The one which I can show every single part of information I have learned during these past years. It is being quite a journey, a very skillfully and emotionally one, and I am thankful to every person who assisted me during that time.

As traditional, I am starting the Acknowledgements by thanking the supervision team. And what a team! Milene, thank you for receiving me in our Portuguese language and introducing me to this project, as well as introducing me to Mark, whom I am thankful for stepping in my journey and accepting my initial proposal. Thank you both for this opportunity, letting me explore my own interests and motivating me to deliver my own best. Moreover, I would like to thank Katrina Heijne for helping and inspiring me in a specific part of the creative facilitation world.

The project was conducted together with LEF Future Center, part of the Rijkswaterstaat. I would like to thank my company mentor, Robert, and also Chabela and Martijn, who were amazingly friendly during that time.

To my amazing IO friends, a huge thank you! Especially the ones who were doing graduation at the same time: Guillermo, I-Chun, Jin, Carola, Pelin, and Min, you are the best "Dfiers" I could ever meet! To Maria Fernanda, who helped me from the very beginning of my journey, you are an amazing friend, "gracias por todo”!

This journey could not be completed without my Brazilian team in Holland. Sara, Bruna, Carina, Guilherme, André, Ben e Erik: obrigado pela amizade! E também para o meu time brasileiro que ainda está por lá: minha família. Pai, mãe e irmã, obrigado pelo apoio e toda a motivação durante esses dois anos.

I am super joyful and lucky to have met such amazing people during that period. I hope the future brings many more adventures for us!

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“Everyone has huge creative capacities. The challenge is to develop them.”

- Ken Robinson

Preface

Creativity is a matter that interests researchers of different areas. Thinking about creative mindset, or how to be a creative person, is usually reserved for the already creative people. Artists, musicians, movie makers, and designers are considered to be creative, and it is also expected from them to act as one. Over the past couple of years of my studies, I noticed different ways of creative thinking, compared to my Brazilian culture. How creativity is taught, indirectly, and how people react differently to it - do they use it in their everyday lives?

Although I consider the Brazilians quite creative, much because of our economic limitations, I was not aware of the world of facilitation. It was only in the last year of my studies in Design for Interaction that I discovered it. With a Graphic Design bachelor, I was always trying to merge my background knowledge together with my Master's courses. And it could not be different for my final thesis.

My personal observations in the people's creativity got keener. I could see that some did not see the power of visuals as a creative boost. As both areas of interest were also compatible with professor Milene, we joined forces to work with LEF Future Center. In the company, people's creativity is stimulated to bring innovative solutions for a determined goal. As I believe we are all creative - and at some point, we may need to be - this investigation might also be useful to other areas, as psychology and business management.

1 The Project

This chapter discusses the aim of the presented project, its significance and used approach. Besides, it also gives an overview of the current context, explaining how LEF Future Center works.

1.1. Introduction

Innovation is a major challenge for societies' status quo. "Practicing innovation is not a mystery, contrary to what most people believe. Innovation is a discipline" (Kumar, p.23, 2012). According to the author, innovation is something to be practiced. Especially considering the changes over the past years, when companies, schools, and government are trying to adapt themselves to today's challenges. Furthermore, future centers emerged from this gap, and are practicing innovation around the world, by bringing different methods, tools, and frameworks to guide participants to transform reality. And in much of these (if not all) visualization is necessary.

The company

This project is conducted together with LEF Future Center, a company part of the Ministry of Infrastructure and Water Management in the Netherlands (Rijkswaterstaat). Since 2008, LEF has facilitated breakthroughs within social issues domain in group sessions - so-called facilitation sessions. Those are guided by facilitators (from the Latin *facilis*, "easy to do"), who are agents that guide the participants, in order to achieve a set goal, letting them be as creative as possible.

Besides "facilitation sessions" (sometimes here called as just "sessions") and "facilitators", there are other terminologies that it is needed to know before continuing the reading. To start with, every session must have a problem at the beginning, which is given by LEF's clients, or the problem owner. The facilitator then welcomes everyone joining the session, and introduces the problem to the participants. Usually, the participants' groups are formed by co-workers and company's colleagues of the problem owner, which might be from different areas. The sessions are guided within LEF's environment, which they call "the space" - rooms, projection, furniture, light, and catering are used as tools by facilitators, in order to achieve the desired goal with participants. Figure 1 shows an overview of the terminology here presented.

At LEF, they have three different available services to their clients: LEF Classics, where facilitation sessions are held with a limited group of participants, usually varies from 30 to 100; big events, where they adapt sessions to be performed with a large group, usually with more than 200; and LEF Next, where different kinds of sessions can be performed, as hackathons and prototyping sessions. For this project, we are going to focus on the most common and famous service, the LEF Classics.

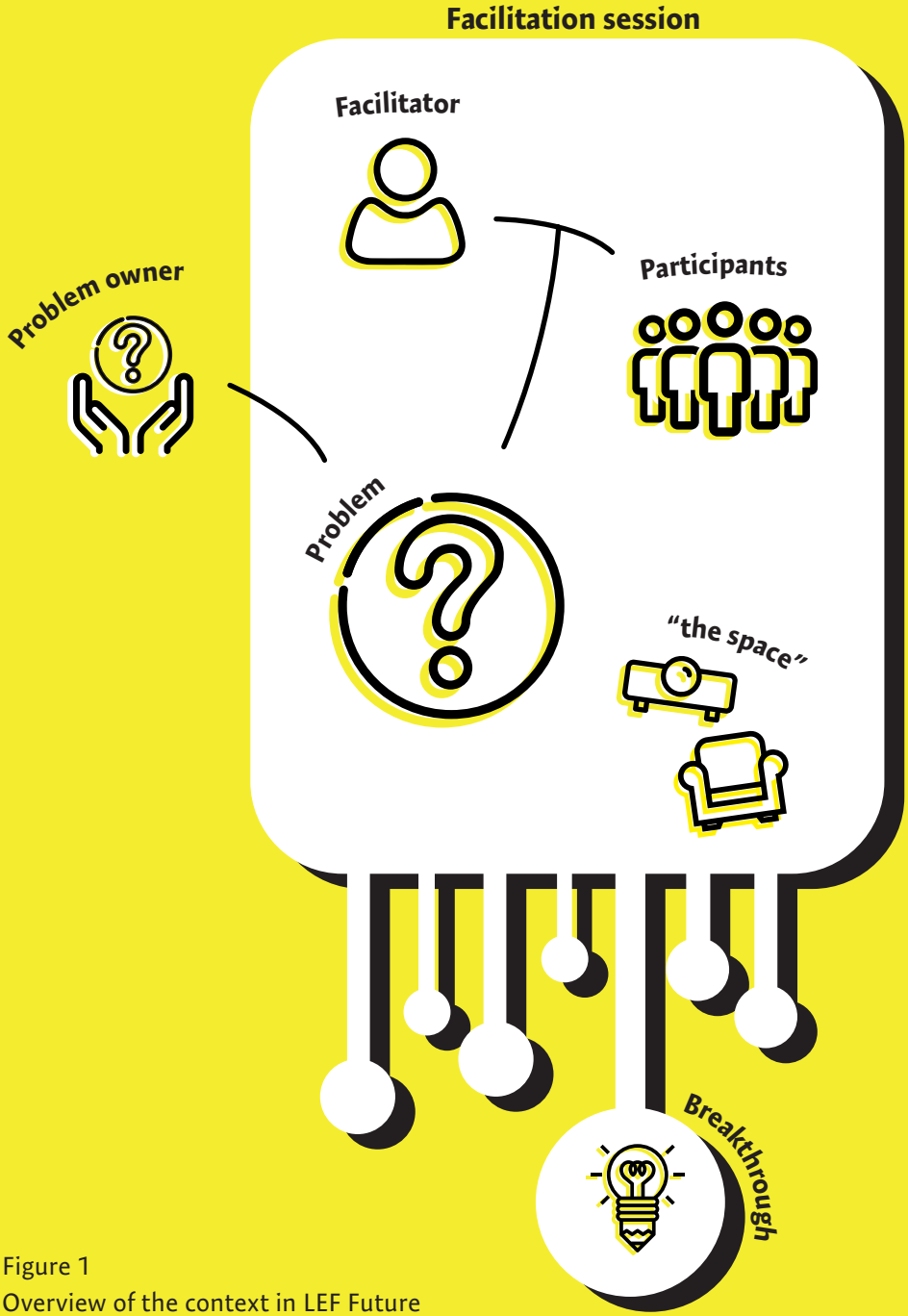


Figure 1
Overview of the context in LEF Future Center and the project's terminology.

The problem

As facilitation is a young and developing discipline, much of the available information is not structured in an official document. Although LEF has been gaining knowledge and experience for 10 years now, they do not have a document that describes and combines their expertise. Not only, they do not have scientific confirmation of their appropriateness on the facilitation work. Now they are working on a project to create a body of practice, which goal is to provide an overview of their expertise and be the first attempt to summarize their work in an open source publication.

At LEF Future Center facilitation sessions are performed and they have the know-how about it. As stated before, LEF's environment, called "the space", is used during these sessions to maneuver participants through its different stages. Working as visual stimuli that can have an impact on the divergence and convergence (Buijs and van der Meer, 2013) parts of the sessions, "the space" can also influence participants' idea communication (eg., Goldschmidt, 2007).

For that purpose, facilitators usually make use of post-its, chalkboards and whiteboards as tools to stimulate participants' ideation, letting them capture their own ideas. Hence, in order to enable the communication of ideas, it is important to investigate how participants' creativity is influenced at LEF and how their process can be optimized. Thus, the overarching goal of this project is: "design a tool or technique that supports participants' creativity during facilitation sessions by optimizing LEF's work process".

1.2. Research methodology

Creativity is a topic of much interest by psychology studies (eg., Hennessey and Amabile, 2009). It has grown theoretically and methodologically, and scientists have made important additions from a broad variety of disciplines, including the field of Design (Brown, 2008). When coming to a session, being creative is what facilitation's participants expect. Thus, investigating when they are more creative during these sessions is a key research objective for this project. Nonetheless, a groundwork of knowledge is needed in order to establish the theory.

This project thesis follows a Research through Design approach (Zimmerman et al, 2007). In its context, the approach focuses on iterative processes that generate insights and knowledge. It allows the designer to use different methods, that can be focusing on the user and/or in the context, letting it be derived to new knowledge (as research publications) and products (which can be 'real-world design').

Furthermore, this project is focused on the contextual part - the facilitation sessions' process, and on the user part - the sessions' participants. Using four iterative phases to explore the subjects, the project is structured as follow:

1. Orientation phase, consisting of literature review and interviews with LEF's facilitators. Here the context is more explored, (re)defining the problem.

2. Exploration phase comes to envision new solutions, performing iteration tests to discover new problems.

3. Conceptualization phase, where one concept is designed, based on the previous iterations.

4. Evaluation phase, consisting of testing and evaluating the final design.

Every cycle is built upon the results from the previous ones, hence creating deeper and outright knowledge of the topic. The aim of this project is to investigate the process of facilitation sessions in order to support participants' creativity. Thus, the research question that guides the investigation in this thesis is:

How can we support facilitation sessions in order to enhance participants' creativity?

To answer the main research question, different sub-research questions derived through:

1. How do facilitation participants capture their own ideas during sessions?

2. How do facilitators support participants in order to let them capture their ideas?

3. How LEF's environment influences participants during the sessions?

Together with LEF Future Center, various research methods have been used, including interviews, observations, and generative sessions. When not available at LEF, some of those were also conducted within the Industrial Design faculty, at TU Delft.

2 Literature Review

This chapter presents an overview of literature pertinent to the topic of creativity and facilitation. Firstly, a review of creativity is discussed, describing its different levels. Then, creative facilitation is explained, followed by examples of how they are performed at LEF Future Center. Lastly, a review of research on visualization and externalization of thoughts are presented, using LEF's "the space" tools as an example.

2.1. Creativity

To start with, we are going to define creativity as it is commonly used by researchers, as "the generation of products or ideas that are both novel and appropriate" (Hennessey and Amabile, p.570, 2010). Here we further explain the famous creative diamond model, based on the ideas proposed by J.P. Guilford (1950), as shown in figure 2. Then we review the different creativity levels, and which forces have an influence on it, so we can better study creative environments.

2.1.a. The Creative Diamond Model

J.P. Guilford (1950) was the first psychology author to distinguish two ways of thinking, naming these divergent and convergent thinking. These lead to the famous creative diamond (figure 2), a model that shows that as many ideas as possible must be created during the divergence phase, while later it must be narrowed down during the convergence phase.

Divergent thinking is a thought process used to create different ideas, trying to explore as many solutions as possible. In this phase, creativity makes an important role, giving significance to unexpected combinations and to the identification of connections among unlikely associations.

On the other hand, the *convergent thinking* is the extreme opposite of the divergent one. It is the thought process behind the ability to make choices, knowing how to select the solution that better fits the problem and problem owner (Simon, 1956). While it is oriented towards deriving one single choice, the convergence phase does not demand as many *creative thinking* as the previous phase.

We are defining creative thinking as the ability of looking at something in a new way (Torrance, 1974).

This model highlighted the fact that a complete creative problem-solving process requires not only the convergent thinking but also the divergent thinking in a continuing alternation.

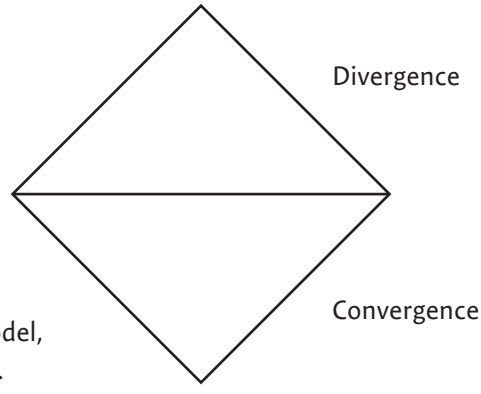


Figure 2
The creative diamond model, based on Guilford's ideas.

The extended creative diamond

Based on the famous creative diamond model proposed by Guilford (1950) (figure 2), Tassoul and Buijs (2007) introduced an in-between step in the middle of the diamond. The previous version only has a divergence and convergence steps, while the new proposal includes a clustering part (figure 3). Every session starts with a task proposal, and from that the following steps:

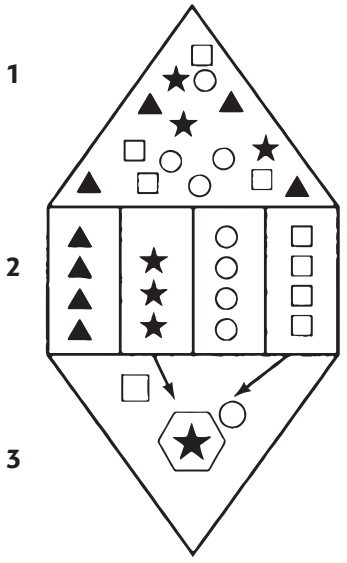


Figure 3
The extend version of the creative diamond (gathered from Tassoul and Buijs, 2007).

1. Divergence is about thinking of the maximum possible actions required to deliver the proposed task.

2. Clustering is about categorizing the previously created ideas into a smaller number of coherent groups.

3. Convergence is about evaluating, judging and selecting the most authentic ideas, making right decisions to continue with the next steps.

Moreover, the model highlights the importance of having the clustering part separeted from the divergence and convergence phases. This importance is discussed and highlighted next.

The CPS model

The Creative Problem Solving (CPS) model is based on Osborn and Parnes (1963) work, that is still being under development process by different authors and researchers. A commonly used and recent basic CPS model is a combination of ideas from both Geschka and Lantelme (2005) and Tassoul and Buijs (2007), adding a step before (task appraisal) and another after (reflection) the previously mentioned creative diamond (page 28):

Task appraisal: is the further investigation of what is the session's task, as well as check if any changes and iterations are needed before starting.

Reflection: is about recalling the creative diamond that just went through. Is also the time to look to the quality of the execution of the task, and decide if continue to a next task or if it is necessary to start over again.

Usually, the CPS model consists of three of these creative diamond approaches, as shown in figure 4. The first for the problem definition, the second for the idea generation and selection, and another for idea improvement (Buijs and van der Meer, 2012). The smaller rectangles before and after the diamonds are the task appraisal and reflection.

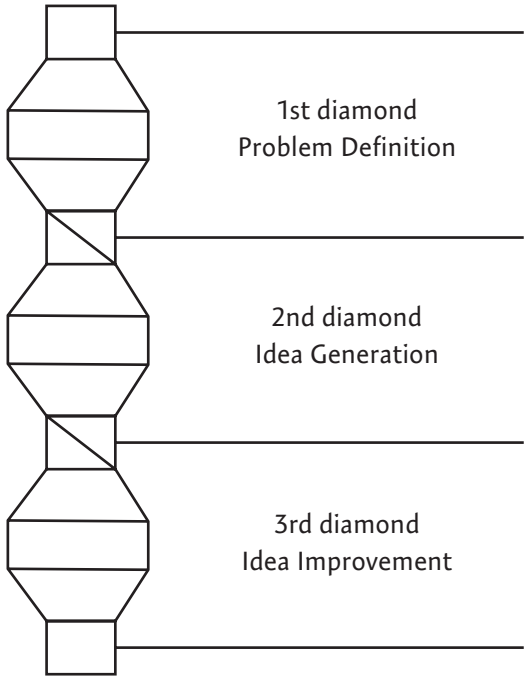


Figure 4
The sequential view of the overall CPS process' steps (gathered from Buijs and van der Meer, 2013).

Reverging & Clustering

Within the classic creative diamond approach, clustering is generally presented as part of the converging stages. While during convergent thinking ideas must be evaluated and selected, protecting novelty (Parnes, Noller and Biondi, 1977), a new phase was developed to differentiate it: the revergence phase. In revergent thinking, ideas generated during divergence must be revisited and rearranged every in order to "build a shared understanding about the content" (Heijne and Smit, 2018).

It was only in 2007 that Marc Tassoul and Jan Buijs described the importance of having a different step in between the diverging and converging, which they called "clustering". Kaner (2007) is another author that describes the importance of having a different step between the two others. For him, this stage is a painful struggle process, that is why he names it "groaning zone". Heijne and Smit (2018) call that phase as *"reverging"*, and we will continue using that nomination.

Differently from the other authors, Heijne and Smit add that *"clustering"* is actually a technique to be used during the revergent phase. As it is the transition step between the divergent and convergent thinking, a change in the participants' mood must be addressed. In order to perform the reverging phase, there are three golden rules that must be respected all the time to assist participants:

- *Active participation:* every facilitation session's participant must be part of the reverging process.

- *Responsive listening:* during the reverging phase is important to let participants listen to each other, instead of trying to reply.

- *Move circular:* the reverging phase is not linear, and it does not matter where to start but just to start doing the activity.

There is not much literature regarding the reverging phase, leading also to a gap of knowledge on techniques to be used during the stage. However, various techniques that are now classified as part of the converging phase could be considered suitable for the new reverging phase. They are usually done on flat surfaces, as whiteboards or blackboards, using the generated ideas on sticking notes to rearrange the options. They are classified as:

- ***Clustering approach:*** is the most used, grouping options that are similar or related to each other, with no dimensions/axis along the rearranged possibilities. It can be used spontaneous or predefined clusters (usually predefined by facilitators).

- ***Scaling approach:*** rearranging options within a 1 dimension/axis, which is predetermined by the facilitator and problem owner. e.g. less important - most important, short term - long term.

- ***Matrix approach:*** rearranging options within a 2 dimensions/axis, as the C-box (Byttebier, 2007). e.g. feasibility and attractiveness.

- ***Cube approach:*** rearranging options within a 3 dimensions/axis, often used on a flat surface, like the others, and not on a 3D cube. e.g. feasibility, attractiveness, and usefulness.

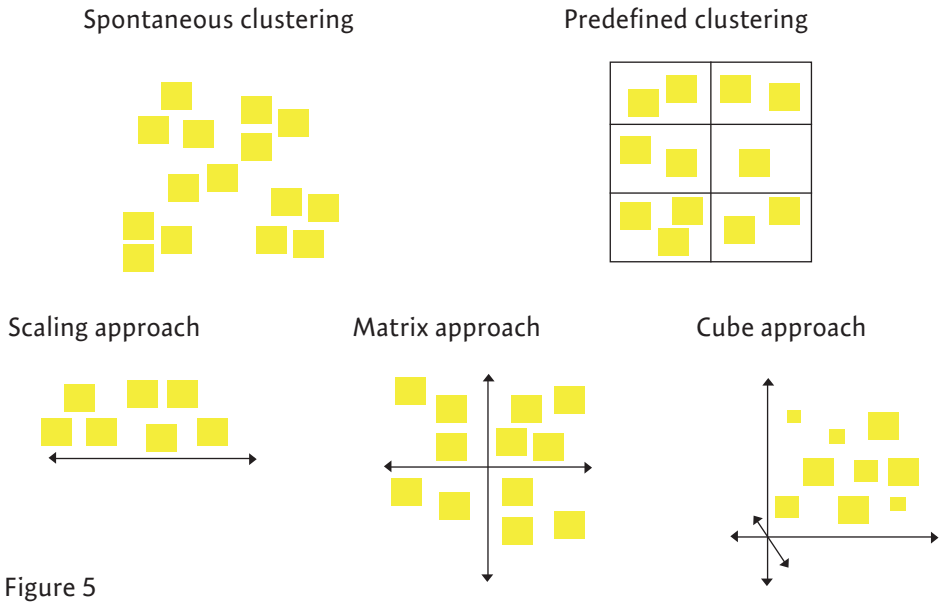


Figure 5

Overview of the reverging techniques, based on Heijne and Smit (2018).

Although it is perceived as part of the convergent thinking, reverging differs significantly in goals and mindset from the converging phase. In reverging, time is dedicated to let ideas grow on participants. Ideas which are poorly formulated, or seem strange at first, get more time to be considered by the entire group. Participants will talk about it, and defend their ideas, increasing their shared knowledge, and ideas' sturdiness. Concluding, it is important to let facilitators be aware of that differentiation between phases, so sessions can have improved outcomes.

2.1.b. Creative Levels

Creativity forces operate at different levels (figure 6). The creativity theme will have more progress when "more researchers recognize that creativity arises through a system of interrelated forces operating at multiple levels" (Hennessey and Amabile, p.571, 2010), and that requires a multidisciplinary investigation. For this thesis, we are focusing on affect and groups creativity, as are the main operated forces during facilitation sessions.

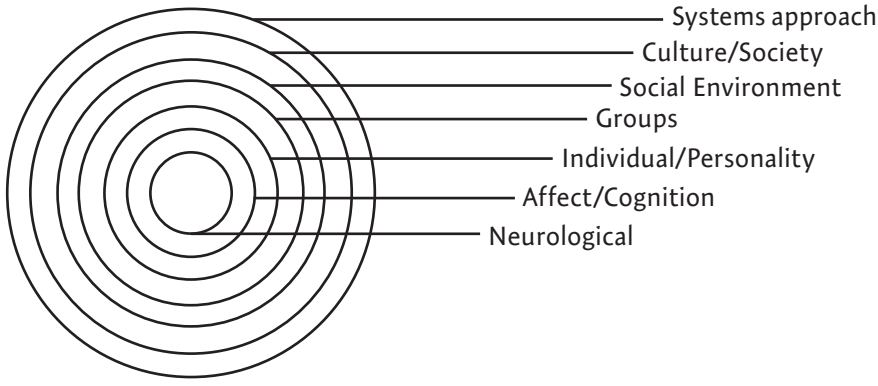


Figure 6
Representation of the major levels at which creativity forces operates. (Hennessey and Amabile, 2010)

Affect

Also associated with the cognitive level, affect is pertinent to the individual level. Within the levels that creativity has influence, affect is the one directly related to the person's emotions. An important factor to boost creativity is the intrinsic motivation, the thrust to commit to a task because it is enjoyable, positively challenging, and/or interesting (Hennessey and Amabile, 2010). Previous experimental studies have shown that positive affect contributes to a higher level of creativity, facilitating not only intrinsic motivation but also problem-solving on complex tasks. Moreover, the creative affect level boosts the divergent thinking.

Groups

Although much remains unknown about the creative process within groups, as a refine understanding of the group process and fine-tune models of group interaction and motivation, significant improvement has been made over the past decades. This lead to changes in the research area, with advancements in the studies.

A good example is that in older studies on creative problem-solving (eg. Treffinger & Isaksen, 1992), conclusions were that the performance of individuals is commonly higher to that of groups. In a shift of perspetives, later Brophy (2006) found empirical support for the creative diamond approach. In that, he affirms that not only individuals but also teams with distinct preferences and knowledge would be good combinations for some problems and deficient combinations for others.

Moreover, the creative group level pushes up to the convergent thinking, as group decisions are necessary. Nevertheless, different group techniques have been used to brainstorm ideas during the divergent thinking, as brainstorming, brainwriting, synectics, and morphology (Buijs and van der Meer, 2013). Even though the group creative level can be important for both divergent and convergent thinking, an important factor for a working group creative process is the sharing of ideas (Paulus and Nijstad, 2003).

In a facilitation session setup, the facilitators can make a session more enjoyable and challenging, supporting participants' affect creative level. Moreover, they work using different techniques that help groups of participants to diverge and converge on a specific problem, improving the group creative level. Nevertheless, facilitators can boost both individual and group creative levels using a set of creative environments. This is better explained next.

2.1.c. Creative Environments

Creativity is not limited to artists and designers. "Everyone has huge creative capacities. The challenge is to develop them" (Robinson, p.17, 2011). Together with the psychiatrist Robin Skynner (1922-2000), the comedian John Cleese, famous for being part of the Monty Python humor group, wrote the book "Life and How to Survive It" (1996), trying to explain why and how relationships between people do or do not work. In this publication, they describe two different states of mind modes that everyone has: the open mode and the closed mode.

It is most often easier to see people working in the closed mode, as it is quite productive. It is characterized by being actively impatient, determined, with no much humor, and feeling fear of the possible failure. For the authors, creativity is not possible when people found themselves in the closed mode. To do so, they must 'turn on' the open mode. This, for instance, is characterized by being relaxed, less purposeful, more playful, and no pressure of a possible failure. When in the open mode, people are more willing to think creatively, and also acting more childlike (MacKinnon, 1966).

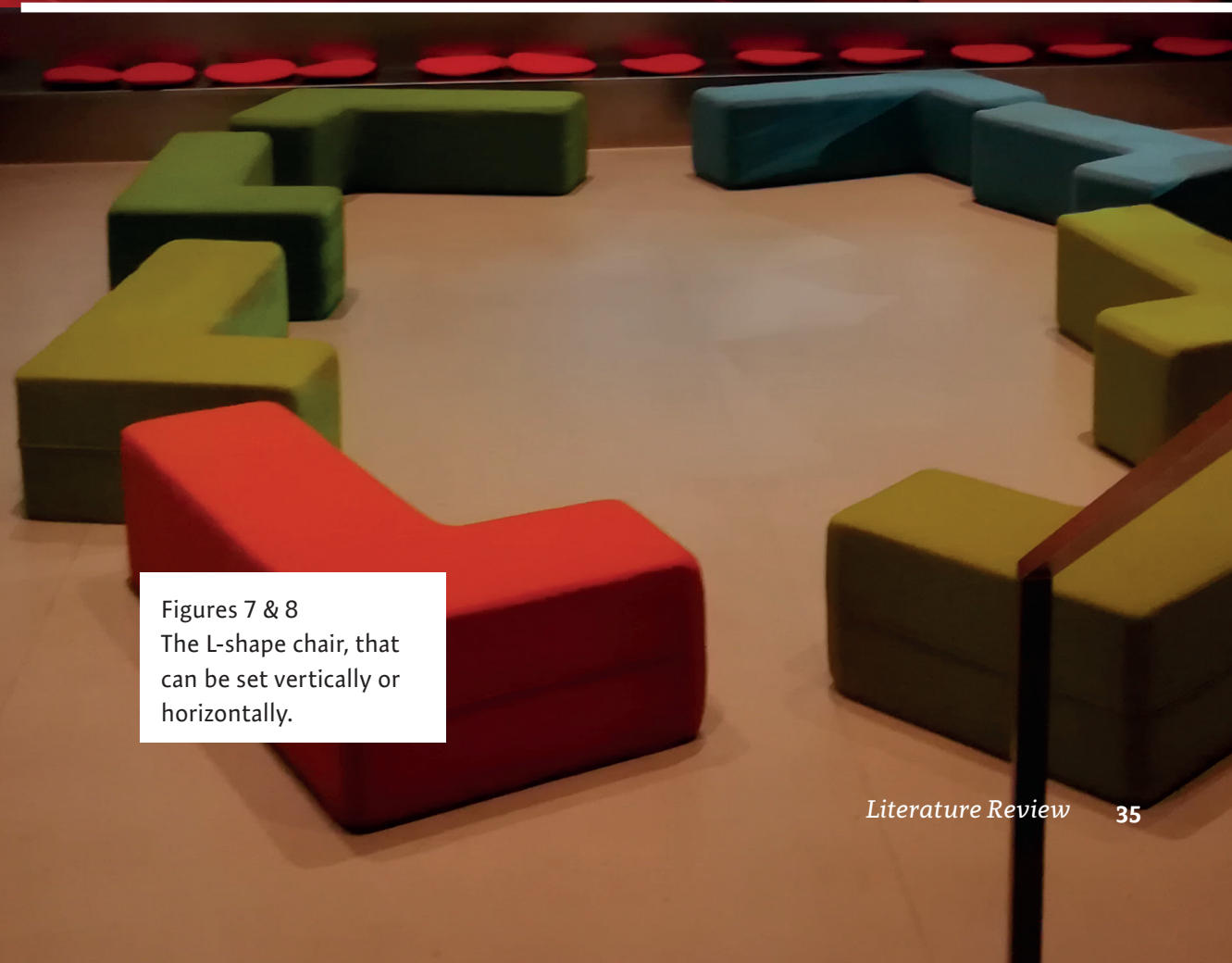
Although it varies from each individual, the open mode can be activated by following specific criteria. These are all related to the physical area people work in, and it is characterized by:

1. Space: so one can disassociate the usual pressures from their daily work, it is important to choose a different space from the common one. With less pressure, the individual can be more creative.

2. Time I: Although a different space is needed, it is also required to be temporary. By creating a momentary shelter, people are able to know when it is time to 'play' and when it is time to stop.

3. Time II: It is normal for people to find themselves anxious about the uncertainty. However, they must prepare how to be more tolerable about it, being at ease with that discomfort. With more control over that anxiety, people are more willing to come up with original ideas.

4. Confidence: Creativity's enemy is the fear of a possible failure. To permit themselves to forget about assumptions, they are free to create.



Figures 7 & 8
The L-shape chair, that can be set vertically or horizontally.

5. Humor: The essential part of the open mode is humor, and it is not about making subjects less serious. It is the main part of creating a playfulness environment, and consequently creativity.

After the idea is made in the open mode, it is still necessary to activate the closed mode to work on its implementation. The ideal setting is that one is able to switch between the modes (Skynner and Cleese, 1996).

As the first described criteria, different spaces are need to be in the open mode. For that, different types of spaces can be used for spefic activities (Thoring, Luippold, and Mueller, 2012). It is also possible for creative spaces to have different functions, as a knowledge repository, indicator of culture, process manifestation, social dimension, and source of stimulation. At LEF, their environment works as a process manifestation, reinforcing specific procedural behaviors. With personalized and adaptable furniture (figure 7), the same space can be used for an open discussion - with chairs disposed of in circles - and for decision-making - with chairs facing each other. This means that the environment is also the fundamental part of the creative process (Thoring, Luippold, and Mueller, 2012).

Concluding, there are some criteria that one can use in order to create an environment where creativity plays a role, as customization and adaptability. However, an important part of this is the individuals' mindset and their tolerance with the fear of failure, which can be improved with time and experience. Not only, facilitators should also support participants with their fears, by transforming it into opportunity. The creative environment can be used for that purpose, and can be interpreted as LEF's space. It is also part of the company's core and will be better described in the next section.

2.2. Innovation in problem-solving

Dorst (2015) starts his book Frame Innovation by saying "we are not solving our problems anymore" (Dorst, p.1, 2015). And that is not because we are incompetent, but because we are being cornered by today's problems. Whereas changes in our world are inevitable, organizations are increasingly facing this type of complicated problems. Here, it is important to define innovation. Creative facilitation comes to overcome these new problems, bringing innovation to organizations.

Innovations as the "successful implementation of creative ideas" (Hennessey and Amabile, p.585, 2010).

There are four properties of today's problems that are deeply different from the past. Those are: open, complex, dynamic and networked. (Dorst, 2015).

1. Open: problems are being more open, making difficult to define a clear border. Context and problem seem to fuse, and more difficult to separate these.

2. Complex: problems now consist of a large number of associated elements. This interconnection difficult the problem to be spliced up into smaller pieces, and nearly impossible to simplify.

3. Dynamic: problems changes over time, shifting connections.

4. Networked: today's society faces an excessive connectivity, resulting in a potentially increased number of stakeholders involved.

Despite the properties of today's problems, organizations are also using conventional problem-solving practices. Dorst (2015) present five of these practices that are killing innovation in different organization sectors. Those are:

1. Lone warrior: one major party feels as the "owner" of the problem

2. Freeze the world: despite the awareness of the world's fluid nature that some organizations may have, they cannot progress without first defining the problem. And by doing that, they also freeze the world.

3. Self-made box: approaching a new problem in ways that they have previously worked in the past, trapping themselves by their habits.

4. Rational high ground: consisted of a persistent rational thinking, with a conviction that there is only one position to be taken.

5. Shape your identity around established practices: because organizations see problem-solving paths as a culture of their core, little room is left to new approaches.

These practices are all adversely affecting the flexibility of innovative approaches. By bringing creative techniques to solve today's problems, facilitation sessions are a starting point for innovation, and what is done at LEF.

2.2.a. Creative Facilitation

Facilitation is a way of bringing different people to move through a process together. It can have many goals and derives different outcomes. *Creative facilitation* adds creative techniques to the world of facilitation. This thesis does not intend to extensively explain how creative facilitation techniques work, as the main purpose of the research is to investigate the process behind it. Instead, it provides a short summary of what is creative facilitation, as well as its used approach and how it is done at LEF Future Center.

The sessions

Creative facilitation is about using creative techniques meant to expand the problem space and elaborate on solutions, as well as leading a creative process team (Tassoul, 2009). By tackling problems that were previously characterized by Dorst's (2015), creative sessions are the starting point for innovation. Whilst it is usually done during idea generation phase, facilitation sessions can be run through different periods of a product/service development. Moreover, its teams are normally composed of "non-creative" participants from different background fields.

The facilitator

The person who is in charge of and leads the group is called facilitator. They can have different study backgrounds, for example, psychologists, communicators, business managers, and designers. As a profession, it started around the 1960's with Alex Osborn and Sidney Parnes in Buffalo, United States. Developers of the Creative Problem Solving Process (CPS), their work involved the importance of creativity in organizations, using facilitation. Facilitator's work is to bring everyone involved in a creative state of mind. This is done using different creativity techniques for diverging and converging ideas, and facilitators must know exactly when to use each one (Buijs and van der Meer, 2012).

The LEF method

The Creative Problem Solving (figure 4) is the standard model used at LEF to perform their sessions. Their main difference from other Future Centers is their whole environment, which they call "the space". There are many rooms available for the sessions, and a lot of it can be adjusted according to the task needs. For example, the walls are movable and can turn two rooms into a bigger one, and different things are taken into consideration for a session, in order to guide participants in the best way possible. LEF divided every aspect of the "the space" into five categories: rooms, projection, furniture, light, and catering.

Rooms: The aesthetics of the rooms play an important role here. They are different from what participants are used to, colorful and with different settings. Apart from that, the rooms are also flexible, and able to customize according to each session.

Projection: Images are thrown at big walls around every room, using computer projectors. It gives the room a different mood, and they have a set of diverse options to choose from, as forest, beach, and Arabian night. With previously studied researches, LEF already knows which images are good for the divergence thinking, and which are better for the convergence thinking (Lamme et al, 2011). Together with the images, that can be static or a movie, specific sounds are also projected in order to have a better ambiance.

Furniture: At LEF, the furniture also differentiates from common spaces. They have colorful bean bags and small chairs, tall bar-like chairs, and a unique L-shape chair, that can be moved and used in different settings. The physical distance between participants determines the social interaction (figure 9). For instance, to reach consensus a small distance is required. On the other hand, the greater the distance, the individuality is increased (Broeze, 2016). Depending on the desired interaction, the facilitator can vary with furniture set-

ups: in a circle, next to each other, opposite each other, at the table, with the backs against each other, etc.

Light: Light has a direct connection with the brain, which initiates physical and psychological processes. At LEF, it is possible to pick different light color variations, from cool ambiance (blue) to hot (red), as well as the intensity. Besides, they have a different impact on the participants. A bright space, for instance, is associated with activity and is better during the divergence phase. A more dim light space makes participants force more to see others, promoting more concentration from them; this is better when convergent thinking is required (Broeze, 2016).

Catering: Participants' nourishment is also taken seriously at LEF. They think of different diets for participants during quick breaks, as well as in lunch breaks. If it is an all-day session, for example, they provide nutrients to make participants more active during the whole time, with glucose and proteins. The way the food is served is also an important point. If they see it is necessary to divide the session into smaller groups, they offer the meal in picnic baskets for four to six participants.

Every single aspect of the session is really carried out carefully, and every facilitator's decisions on LEF's space are meaningful and may influence the session. LEF Future Center is proud of it and puts these in their core values of the company. They usually perform sessions with Rijkswaterstaat's clients and stakeholders, focusing on breakthroughs and innovation for the Dutch ministry. They have more than 40 facilitators available and each has their own expertise. Some know more about handling conflicts when the session aims to have agreements between involved parts, others have more knowledge on developing sessions to let participants generate ideas for a determined goal. The sessions can be for one moment of the day (morning or afternoon), to a whole day and even be divided into more than one day. In any circumstance, they can vary in size as well - usually from 40 to 100 participants, but can also have less.

Figure 9
A group of participants during a facilitation session, using the provided furniture.

Participants are usually employees from their stakeholders, different companies that work together with Rijkswaterstaat. For this reason, they also make use of facilitator helpers to handle the sessions and divide the big group into smaller ones (usually within groups of 5 or 6).

Although LEF Future Center already have all this knowledge on creative facilitation, as well as innovation in the area, the facilitation area is a recent and ongoing study. They have a lot of knowledge on the classic diverging and converging thinking, but not much on the recently introduced reverging. For this reason, other questions arose from that: how do LEF's facilitators perform the reverging phase if they perform it at all; and how do they perceive participants' creativity? Those are further discussed and studied with the interviews, in chapter 3.

Figure 10
Participants during the beginning of a session at LEF Future Center.

2.2.b. Facilitation process

Sessions within LEF often focus on breaking through fixed thinking and behavioral patterns in order to bring solutions to problems. These problems are usually focusing on the future and in the 2050's European policy and strategy for environmental, energy and climate targets. More information on how is the process of a session at LEF and in general is followed.

As we previously discussed, facilitation sessions bring innovation while making different people to think about a specific problem together. LEF Future Center have been doing facilitation in Rijkswaterstaat since 2008, focusing on social issues the Ministry faces. LEF provides a direct contribution to the power of change and the problem-solving capacity of Rijkswaterstaat and stakeholders, guiding breakthrough sessions.

Preparation

Before the session itself, the facilitator must discuss with the problem owner what the problem is. Usually, during that, the given problem is though between them, leading to a new and better-defined problem. Besides, the facilitator must think out how that discussed problem will be tackled, selecting the best methods and approaches for that. During that, the number of participants, groups, tools and time are determined.

Beginning session

After having all participants arrived in the space, the session is then started with an explanation of what they are going to do during that. It is common that the facilitator introduces him/herself, as well as others involved. During that, they show participants the agenda for the session, and what they will be doing during each time. After that, there is some time to let participants meet each other (figure 10), talking about themselves. One example of an activity for that is asking participants to "high-five" each other before talking. This whole part should last about 40 minutes.

Problem introduction

After having everyone settled in a similar mood, the problem is discussed and introduced. Computer presentations are done for that, having a specific slide for the problem statement always on during the session. During the introduction, participants have some time to discuss the problem, solving doubts they might have about it. The problem introduction should be quick and clear, with about 20 minutes.

Divergence

With the problem in mind, participants already start to think about possible solutions to it. This is the divergence phase when facilitators support participants to create the maximum amount of ideas as possible. Here, brainstorming is a usual technique, that can be done with individual and group activity. If necessary, smaller groups of 4 to 6 participants are formed in this phase, which may help to let participants generate more ideas. This can be done by letting them create only one part of the idea in one minute, passing the paper so the other can complete it. Another activity can be to let participants answers "what if" scenarios, or with analogies (Buijs and van der Meer, 2013). At LEF, "the space" has much influence on participants, and facilitators should know what to change in it. This part may take up some time, with about one hour.

Revergence

After generating different ideas, the groups should be asked to make clusters out of it. Even though the revergence is commonly set as converging, the phase is here divided to show how it should be. The facilitators can give topics for the clusters, so participants put their ideas into these. Or they can ask participants to generate clusters on their own. This can be done by asking participants to share their ideas between them, and later stacking similar ideas. This part can be time-consuming, as discussions naturally arise through one hour might be enough.

Convergence

Choosing one idea among so many possibilities can be a difficult task. For converging, facilitators may give participants a number for voting in their most favorite idea (for example, 3 votes). Called “hits" or “dots" (Buijs and van der Meer, 2013), ideas with the most numbers of votes will be set as chosen. Besides that, facilitators can also determine criteria for the selection (for example, novel, feasible and effective). It is important to let participants converge while protecting the ideas’ novelty, and they can be asked to prepare a small presentation of the idea. This part can take more than one hour.

Presentation

After selecting the idea, a small presentation of each group can be done. If the number of participants in the session is high, then a limited number of groups must be selected randomly or asking who wants to present. This part is important when the problem owner is present, so he/she can have an overall perception of the session’s outcome. This part should not take much time, and 20 minutes is enough.

Even though facilitation sessions have a usual process with the phases, it will depend on the facilitator how it will be performed. At LEF Future Center, there are more than 40 facilitators and they all have their own expertise, as well as a predilection to approaches and methods. It is important to understand how a facilitation session should be performed, in order to further investigate the context’s problem.

2.3. Visuals

Another important theme that englobes the creative facilitation world is visualization. Visualization is the action of creating visuals, from Latin visualis "of sight". It can be in the form of a photograph, a computer render, a drawing, or even picturing things in your mind. As said before, even though LEF Future Center makes use of different types of visualizations during sessions in order to stimulate participants in its different stages, they have not much knowledge of the participants' visual outputs. Here we are focusing on that last one.

When thinking about visualization, usually comes to people's mind the idea of making something pretty, that brings attention, that is eye-popping. Ben Shneiderman, a computer scientist that has fundamentally researched in the field of human-computer interaction, said that "the purpose of visualization is insight, not pictures" (Shneiderman, 1999). Although it is recognizing the importance of the aesthetics of a design or an art piece in different work areas, in creative facilitation we focus more on the insights visualization can bring. The goal is to make something understandable, to capture someone's idea and move forward. Sometimes it is based on text only, with the absence of drawings.

When using visual materials in a design process, as like in Creative Problem Solving, the group shared knowledge is facilitated (Neumann, Badke-Schaub, and Lauche, 2009). That is mainly because images are generally more efficient than text in terms of conveying information, as it requires less cognitive energy than from a written stimulus (Ware, 2008). During a facilitation session, the most used visual materials are simple sketches, as it is not a requirement to be an artist to be a participant.

Riding and Cheema (1991) created a designation of cognitive styles to explain information processing strategies. In that designation, the authors differ between "imager" and "verbalizer" cognitive styles. Being an imager a person who has the tendency to make use of images to search and/or represent information, and a verbalizer a person who prefers to make use of words to do so. Not surprisingly, creative people are considered to be imagers.

Even though visual materials are a good source of shared knowledge, it is important to let participants express their ideas also using written words. On a work with design students, Goldschmidt and Sever (2010) concluded that the use of different kinds of text including ideas can be inspiring and increases originality and creativity. During a facilitation session, usually, facilitators also ask participants to write a small summary of their ideas. It is also observed that, during creative facilitation sessions, sticking notes are commonly used for written text only. That could be explained because not everyone is an "imager".

Concluding, it is important to let participants express themselves with visual representations, not only using text but also sketches. Text is an clear form for them to express their ideas. Together with words, created visuals are easier to communicate, facilitating the shared understanding between participants. The combination of words and visuals would be the perfect setting, and for that purpose, sticking notes are widely spread into the creative facilitation world, just like it is at LEF Future Center, and it let participants easily note down their own ideas on paper.

Figure 11
New York's subway sticking note campaign, created by Matthew Chavez. It is a campaign created in 2016, that lets subway commuters spread kind messages to others. In this case, the sticking notes themselves are already a form of visual representation.

2.4. Conclusion

The literature study has established an understanding of how a creative facilitation session works, as well as the importance of participants' creativity. A better indication of the focus of the project has been established as well, and is to design a tool to support participants' creativity during facilitation sessions.

Scope

Considering the reviewed literature, the revergence is a new nomenclature for an already known phase, part of the creative diamond approach. The distinction between that new phase with the others (divergence and convergence) is important, though. It is not about converging to a final idea. Besides, the phase aims to build a shared knowldge betwenn participants, revisiting every generated option during the divergence phase.

LEF Future Center already has much knowledge and research on the divergent and convergent thinking within their setup. To immerse in the revergence phase would be a good step forward.

The future designed tool must have some criterias, focusing on the participants and facilitators. So it should both aid the participant as an individual in the process, as well as the group thinking. Moreover, it should also inform facilitators about diferences between the phases. This choice has been made because literature confirms that the reverging phase is usually perceived as part of the convergent thinking, even though having different goals for the session.

List of topics

Different topics have emerged from the reviewed literature.
They work supporting the most important discussed topics, and structuring the research. They are as follow:

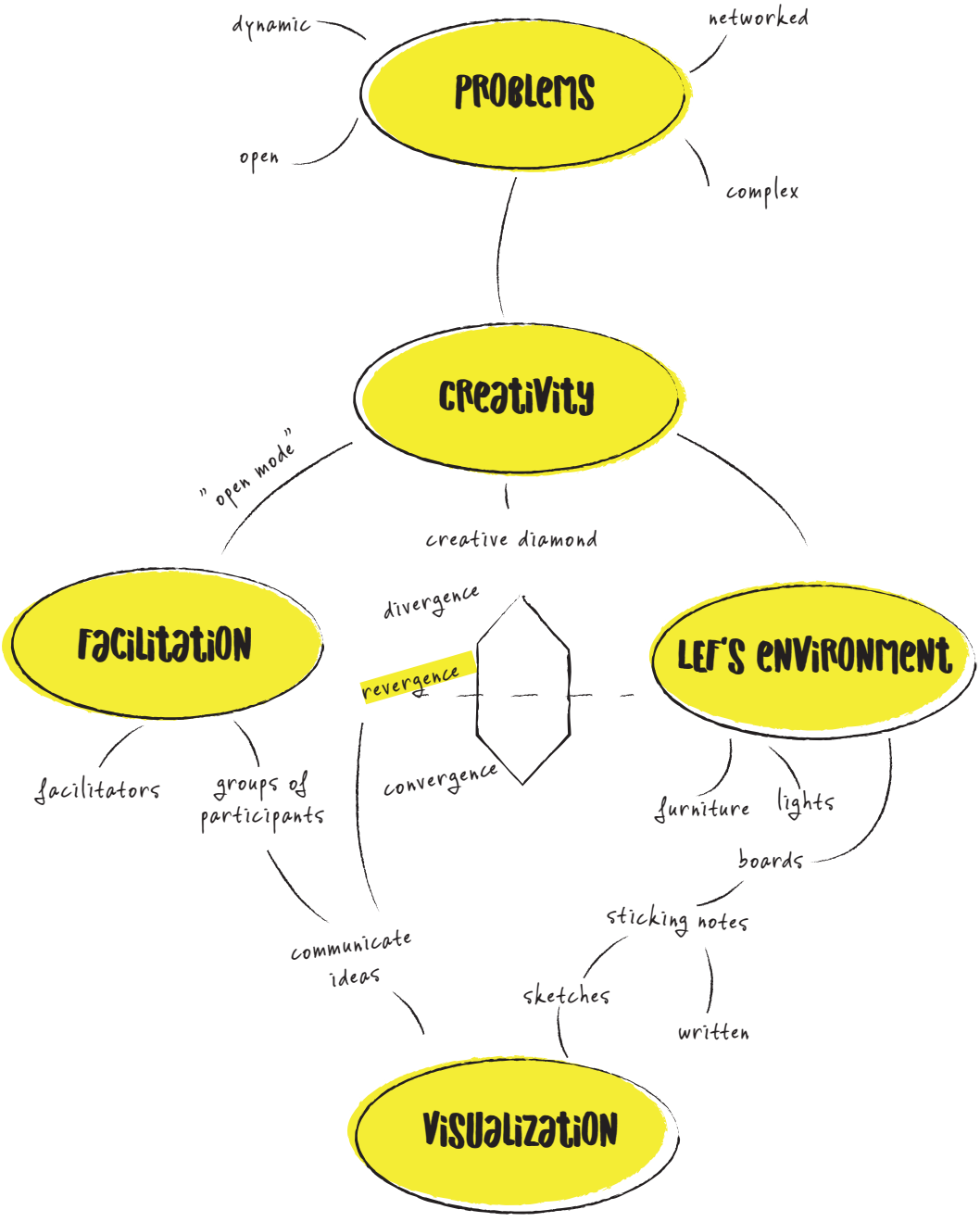


Figure 12
Mindmap generated from the conclusions of the literature review.

New problems

Recent problems are becoming more open, complex, dynamic and networked (Dorst, 2015). The core of this project is on creative facilitation sessions, which brings innovative ideas to different proposed problems in companies.

Working with criativity

By bringing different people from different working areas to think about the same problem, creative facilitation assists in the solution of recent problems the world is facing. Using a creative mindset for that, different techniques are applied during a session, assisting the participants to get into the right "open mode" for creativity.

The new changes in the sessions

Using the already known creative diamond approach (Tassoul and Buijs, 2007), recent studies have shown the importance of distinguishing the step in between the divergence and convergence phases. The revergence is then used to better describe that phase and aims to build a shared knowledge between participants (Heijne and Smit, 2018). Although it is already been part of a session, it is commonly misunderstood as part of the convergence phase. To emphasize in that phase is a way to deal with participants' creativity.

The role of LEF's environment

LEF Future Center has a major infrastructure to support creative facilitation sessions. They make use of different images, furniture, lights and even catering to assist participants during the sessions. Just like the recent studies on the reverging phase have shown, they do have knowledge on the classic divergence and convergence phases (Broeze, 2016) but not much on that reverging part of the process. Together with their environment, they also provide different tools for the sessions, like whiteboards, blackboards, sticking notes, and markers. The ideal design should work within that environmental setup.

Visualization as creativity boost

Even though it is expected from participants to be as creative as possible during the sessions, it is common to find people who are not "imagers", or in other words, who are leaning to make use of images to represent information (Riding and Cheema, 1991). Visualization is an easier way to communicate a message and can be used during the ideation part (divergence). Moreover, written words are also good to complement the generated ideas, and it is actually the most common mean used by participants, especially in sticking notes. One of the next steps is to investigate how facilitators stimulate participants to make drawings if they do so.

Further questions

In addition to the already mentioned directions for the design solution, the indicated topics guides to further questions. They also evolved from the initial research question and sub-questions (page 22) of the project, and will be investigated using context mapping skills in the next chapter.

- How do LEF's facilitators guide participants through the sessions?
- How participants' creativity is perceived during a session setup?
- How is the reverging phase usually done at LEF, if done at all?
- In which way LEF's facilitators can stimulate participants to make sketches?

Problems

Today's problems are open, complex, dynamic and networked (page 38).

Creativity

Creative facilitation brings different people to move through a process together, using different creative techniques. It assists in the solution of today's problems, bringing innovation to companies (page 39).

Creative facilitation uses the creative diamond approach. It is based on the divergent and convergent thinking (page 28).

Sessions

During divergence phase, it is important to let participants generate as many ideas as possible (page 28).

The aim of the convergence phase is to let participants choose one final idea, narrowing down from the previously created ones (page 28).

Reverging is a new phase in the creative problem solving that aims to revisit and rearrange every generated option during diverging in order to build a shared knowledge about the content (page 30).

LEF's environment

LEF Future Center performs facilitation sessions and makes use of different settings of rooms, projection, furniture, light, and catering in order to get participants in the right mood for each specific phase (page 40).

LEF's creative environment can be used by facilitators to support participants with their fears, by transforming it into opportunity (page 40).

Visualization

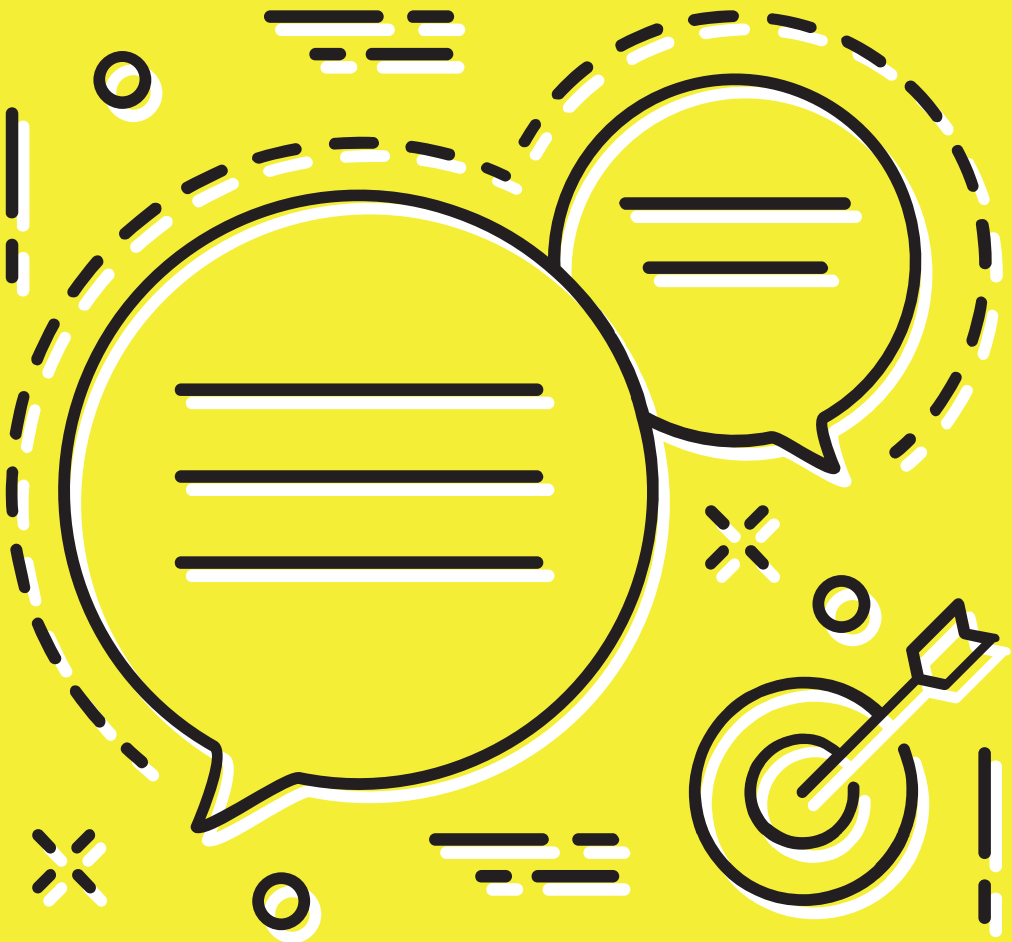
Sketching and written summary are important to let participants express their ideas together with the group, improving its shared knowledge (page 48).

Using visuals are an easier way to communicate and convey a message (page 48).

Table 1
A summary from the reviewed literature, based on the conclusions topics.

3 Context mapping

In the previous chapter, we investigate literature about creativity and facilitation. Now, we go deeper into the context, by focusing on the facilitators' process at LEF Future Center.



3.1. Introduction

Context Mapping is a generative design approach that involves the user to generate knowledge (Sanders and Stapers, 2012). In order to get deep into LEF's context, it is necessary to understand the facilitators' motivation and their process. There are many different techniques to make use of during this part of the research. Here, observations in the context were made. Additionally, interviews with facilitators were held together with a sensetising tool (process timeline, showed in Appendix B). By letting them remember of one specific session and going through it in layers, interviewees are able to unravel their feelings about the topic. It is important to highlight that they are the experts on the topic, and using this approach, the researcher is looking for the latent knowledge around it (figure 13). With that knowledge and information at hands, we can reframe our problem by targeting one specific moment of the whole process.

3.2. Data collection

Through the period of three weeks, observations and interviews with LEF's facilitation were held. The minimum number of participants advised by the Delft Design Guide is three (van Boeijen et al, 2013), and the interviews were stopped when sufficient acknowledgeable insights were gathered. Their input is here anonymized, using appropriate color coding during the analysis and being identified by the following letters: I, N, M, and D. All the participants are Dutch, with an average age of 53 years, and all of them are female. They were selected for interviews according to their experience time, being all of them working as a facilitator for more than 10 years, on average. Most all work as a part-time facilitator at LEF and also have their own companies, where the facilitation service is provided for different clients. However, they came from different study backgrounds: human geography, business administration, and human communication.

Figure 13
Participant N sketching the timeline during interview.

3.3. Obersavations

When exploring the context, it is valuable to articulate the aspects that influence the interactions. Observing the users in a real-life situation enables the better understanding of the phenomena, as well as the influential variables (van Boeijen et al, 2013). For that part of the project, four different sessions were observed at LEF Future Center. Two of these were held in English, with about 20 participants each. The other two were held in Dutch, with about 80 to 100 participants involved. Even though the sessions are confidential for the clients, not being fully described here, the content of the sessions is unimportant for the phase. To observe sessions that were distinctive from each other in terms of the number of participants and type of facilitation, assisted in richer findings. Besides, as the researcher does not have fluency in the Dutch language, the sessions that were held in that language were perfect settings to act as a "fly on the wall", observing the whole, not the content.

The main findings from the observations are listed below:

- At LEF, with more than 40 facilitators, they have their own expertise, leading the sessions using different methods.
- The outcomes and final results of sessions are influenced by the number of participants.
- Participants start the sessions in a positive mood. The ending is also usually well perceived, as they enjoy to see the outcomes.
- LEF's environment plays an important role to stimulate participants (figure 14).
- Some sessions might end without a final decision/idea on the problem (convergence phase), as requested by the problem owners.

Although observations are insightful, interviews with facilitators must be held. In order to further investigate the context from their own perspective, four interviews were performed, and are analyzed next.

Figure 14
Group of participants of an observed session. The tall seats and table make them more prone to discussion.

3.4. Interviews

The four facilitators were interviewed using a semi-structured guidance, together with a sensetising activity - a timeline for the facilitation process. The questions were previously established and can be found in Appendix A. Even though the questions were not leading the conversation, the interviewees should give answers to all of it by the end of the interview. Each one lasted from 40 to 50 minutes, being voice recorded and pictures taken from the interviewees. For this reason, a consent form was handled during the introduction of the interview (Appendix C).

The sensetising tool was used not only as a form of documentation but also to facilitate the participants' conversation. It was handled as a timeline (figure 15) in an A3 size, as well as colorful pens and

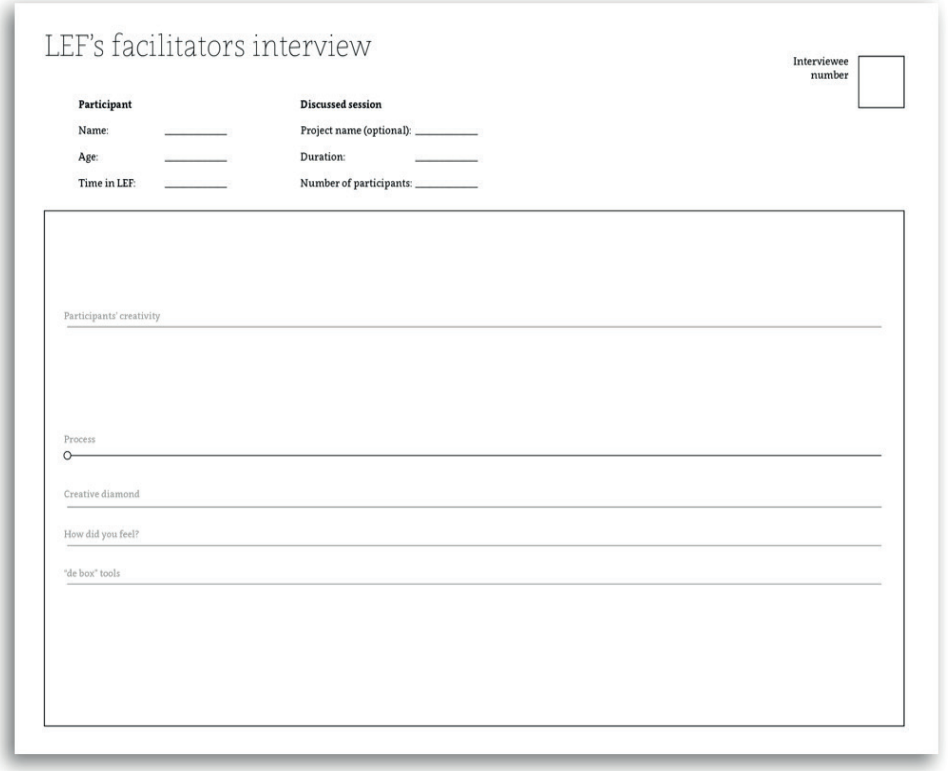


Figure 15
The sensetising tool with the process timeline.

markers. The timeline was divided into five different parts: process, creative diamond, how did you feel?, participants' creativity and "the box" tools. The main line was the process one, and it was asked from the interviewees to fill in it in first while saying out loud each part of it. It was also a time guide for the other lines, which were filled in according to specific questions. The timelines filled by the participants can be found in Appendix B.

Questions

Before the interview, interviewees were asked to think of a recent facilitation session that was performed at LEF Future Center and that could be discussed. This session could be about any topic, and it is clearly stated that they are not being evaluated.

The interview questions are formed around the conclusions from the literature review and can be found in Appendix A. They are divided into six topic categories and each question could be inside one or two of those. The categories are:

1. Process - focusing on the facilitation session process used by the facilitator;

2. Reaction - could refer to both the facilitator's reaction as well as the one from the session's participants;

3. Participants - questions that were labeled having in mind the session's participants.

4. Tools - within this category, questions are formulated within "the box" environment tools, and also the tools that are handed to participants to express their ideas.

5. Moment - with direct relation to the given timeline, these are questions that are related to a specific time period of the process.

6. Creativity - focusing on the creativity topic, it was always together with one of the previous categories.

The last given question asks facilitators to think about a metaphor for the facilitation session. This information is also used later in the ideation process.

3.5. Data analysis

The data retrieved from the interviewees was analyzed using the statement cards technique (Stappers and Sanders, 2012). Every interview was audio recorded and later the most insightful quotes were transcribed into 12 to 18 cards for each participant. Each card (figure 16) was printed with a quote on the top, a color code for each interviewee and a blank space to write down paraphrases of the quotes. After giving a paraphrase to each one, they were all clustered with similar interpretations, which lead to nine emergent categories. Later, this process results in 18 codes, grouped into 9 categories and one main theme: facilitation process.

The categories are: facilitator, participant, team, creativity, session, tools, drawing, clustering, and active mood.

To give a better understanding of the process, one code for clustering is "drive for goal direction". Another code for the facilitator category is "role as an outsider". The full coding structure used for the interview responses can be found in Appendix D. The completed timelines from participants are later revised individually, looking for similarities in the process.

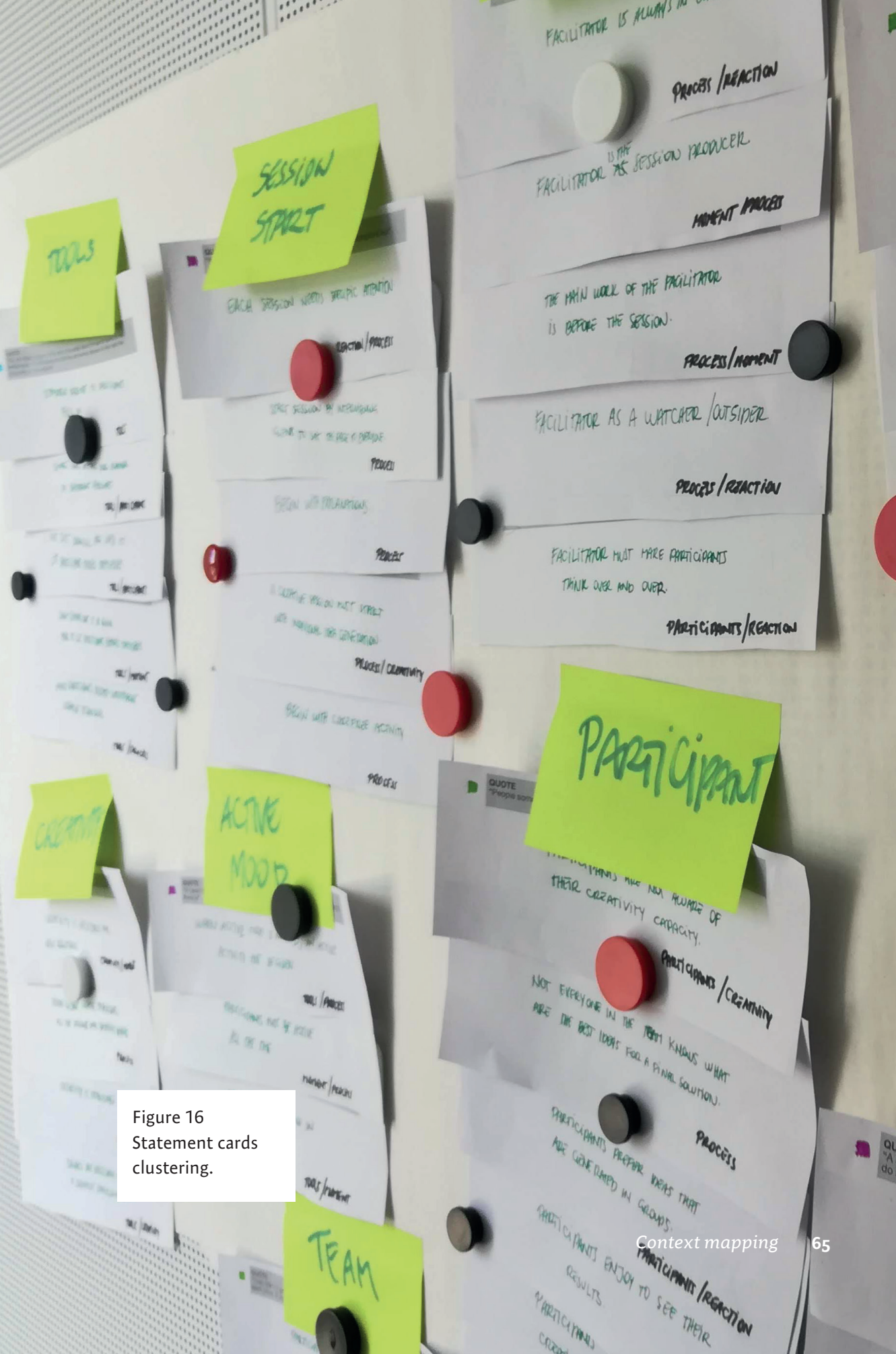


Figure 16
Statement cards clustering.

3.6. Results

The analyzed data yield three outcomes: the clustered statements, a visualization overview of the current situation and definition of pain points in that process.

Clustered statements

As the interviewees' quotes have little utility when merely listed, they are clustered for clarity. They are as follow.

Facilitator's role

An outsider to be inside

The facilitators should be present at every part of the facilitation session but most important, they should not interfere in participants' ideas. Nevertheless, they must adequate the activities and environment to invisibly trigger participants to diverge, reverge, and converge, without they being aware of it.

Attitude of control

As they have everything planned for the session, they are in charge of it. They have to be tuned to the participants' reaction and adjust accordingly.

Interviewee N: "I am always in control. Because I know what is going to happen. I know what is the next step"

Participant

Underrate creativity

Within the facilitators' perception of the participants, they might think that are not creative, and almost all underrate their own capacities.

Own judgments, own ideas

The participants, as individuals, have their own judgments about the world around them. This is already a kickstarter for the individual idea generation.

Interviewee N: "If in the purge you (participant) already have your summary, then will be missing only the ideas clustered(...)"

Team

Two is a company, three's a team

Teams are more reliable and dynamic when formed by three participants (Hunter, 2007). It is most common to be formed just after the individual idea generation.

Trust brings opportunities

Trust is an important piece for a good team relationship. Even though, when the lack of trust is recognizable, the facilitator should not change teams.

Session

The facilitation format is wide

There is no strict way of performing a facilitation session. The facilitator has the knowledge and should know when to apply different techniques.

An explanation is a starter

The facilitation session starts with the facilitator explaining the problem to participants. By introducing them to the topic, the facilitator already triggers participants to ideas.

Creativity

Participants' ideas are underrated

During sessions, problem owners may ask to not let have a decision (converging) on a final idea. Even thoguh the intetion of the sessions is to make participants come to a final result/idea, they are not perceived as the best to make that kind of decision. That's because clients might think participants are from different work areas, and not specialist on the problem.

Drawing

It is not about the quality

Although participants might think they are not able to draw when they see their colleagues doing quick sketches they get motivated. In the end, the idea is not to have new artists in a room but to stimulate their communication of ideas (Shneiderman, 1999).

Tools

Beyond visuals

Participants can find different tools to express their ideas during a session. It will depend on its goal and on the facilitator. They can be stimulated to play a role, to perform a "mise-en-scène", but also always to write down in words their ideas, on sticking notes and whiteboards

Interviewee I: "To write down thing, for instance, post-its. Drawing, maybe own paper for individual, and whiteboards for group."

Standard format brings organization

When a facilitator has in hands a standard format for ideation, the later process of clustering is more organized. One example can be a standard business model canvas.

"Interviewee M: "So I had prefabricated A3 with questions that they can workout(...)"

Clustering

As a goal direction

There is no much use of the individual ideas without a cluster. It helps to better define the goal direction, narrowing down to a few sets of ideas.

Clustering misunderstanding

The reverging phase is perceived as part of the converging part by facilitators. The most used reverging method by LEF's facilitators is the clustering (both spontaneous and predefined).

Participant N: "If you converge in the same session, very often you would have invited people in the divergent phase that are not part of the project team... What I have experienced is that if you let them choose the best ideas, those are not the best ideas according to the project leader"

Mood

Be active to be creative

Different activities are commonly used during facilitation sessions. These allow the participants to be active during the whole process, stimulating their creativity.

Timeline process overview

The analyzed sketches in the interviewees' timeline result in a visual process overview (figure 17). The original material can be found in Appendix B. It is used to synthesize the current situation, for a clear communication of the process.

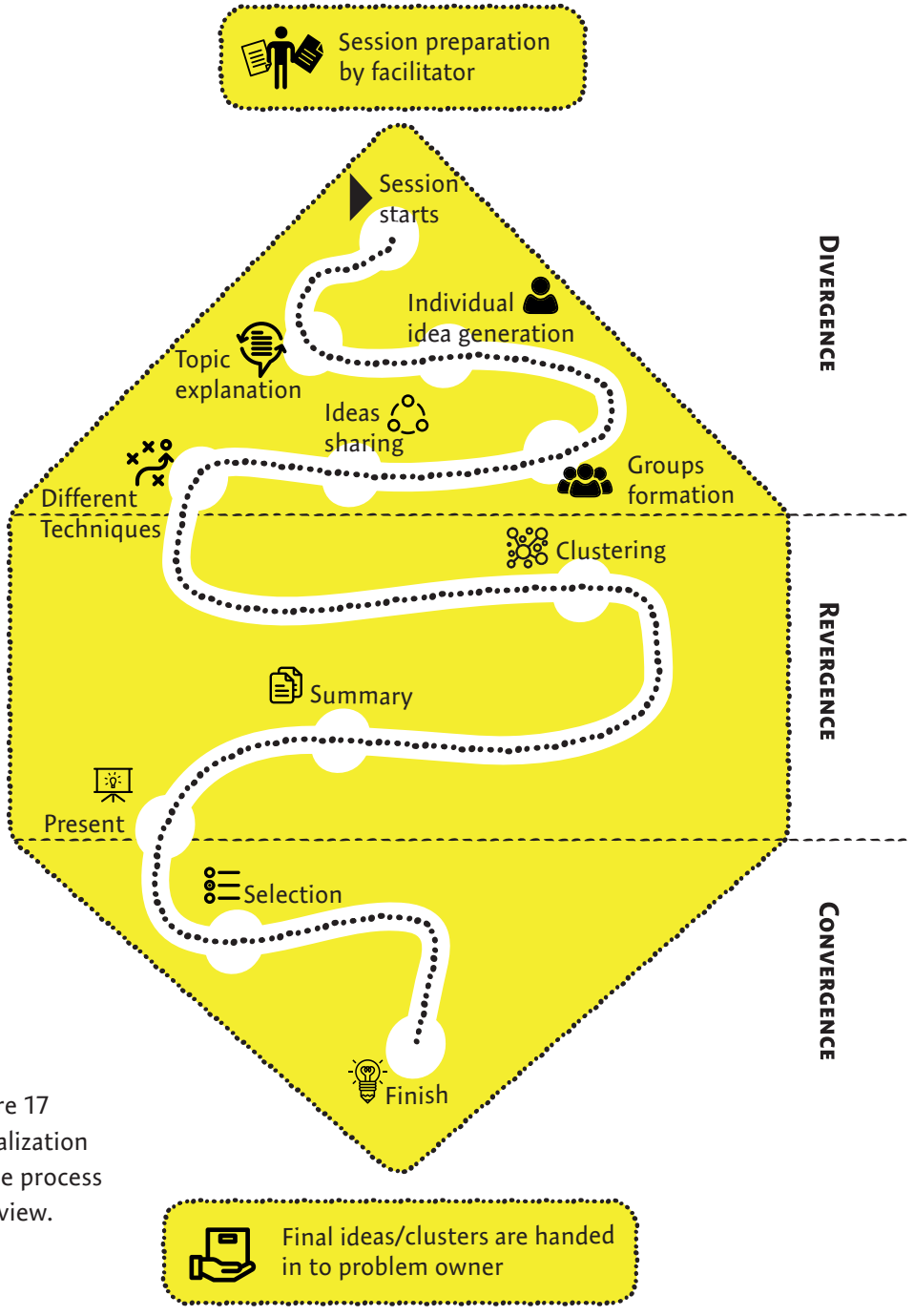


Figure 17
Visualization of the process overview.

Pain points

Pain points are perceived problems, is an opportunity for future solutions. After the analysis of the interviews and with a better picture of the current situation at LEF Future Center, we can determine where the facilitation process can be improved. During the context mapping, two main pain points were detected: the clustering part during the facilitation sessions, and the final deliverables to the problem owner. As the literature review highlighted, the reverging phase can be mistaken with the converging phase. This was also found with LEF's facilitators' perception, which can cause a disorder which the clients' deliverable.

In order to formulate the perceived problems in a structured way, the 5W1H checklist is used. This tool helps to understand the problems, involved stakeholders, and values (van Boeijen et al, 2013).

	 Clustering	 Deliverable to client
Who	Participants and facilitators	Clients and facilitators
What	No standard format for the revergence part	Messy final deliverable to clients
Where	LEF Future Center session	LEF Future Center session
When	During revergence phase	When the session is finished
Why	There is an increase in the difficult of tracking participants' best ideas	It makes difficult to clients analyze the best selected ideas/clusters from the session
How	Different means of clustering are used	Different means of clustering are used

These pain points are the triggers for the problem definition. In the next chapter, we will further develop these, looking back at the original problem definition and (re)defining the problem statement.

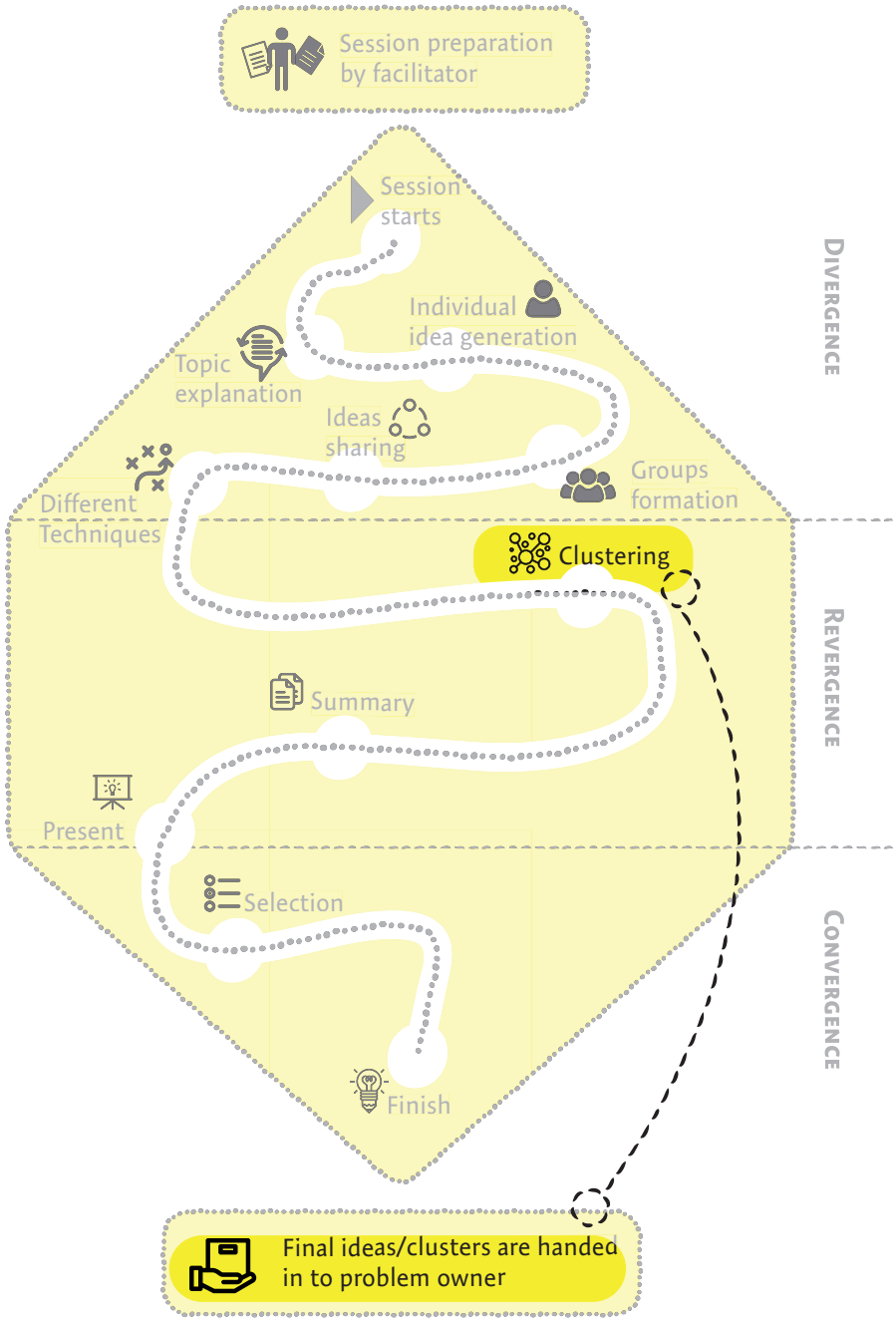


Figure 17
Visualization of the process overview with pain points highlighted.

3.7. Conclusion

The findings from the context mapping are here combined with the ones in the literature review. Once again, a list of topics is created based on the findings, supporting in the research's structure.

Comprehend the revergence

The reverging phase can be misunderstood as part of the converging phase of a session (Heijne and Smit, 2018). LEF's facilitators usually also do not distinguish the difference between these two steps neither, which can cause a confusion when performing it. The design then is a tool to support facilitators during that stage of the session.

Embrace visuals and words

The drawings and sketches participants make during a session assist them to communicate their ideas (Shneiderman, 1999), as well as stimulate them to be more creative (Ware, 2008). As many participants prefer to just write their ideas in words, it is better to have a combination of both. It is important that the tool stimulates sessions' participants to make drawings for their ideas, also assisting facilitators.

A formatted model leads to organization

The open format means that is commonly used at LEF (whiteboards, sticking notes) to let participants express their ideas can be enhanced by facilitators. Some of them bring standard formats to sessions, which also benefit their organization. The tool should provide facilitators with an adaptable surface, that can be added and/or changed but them easily.

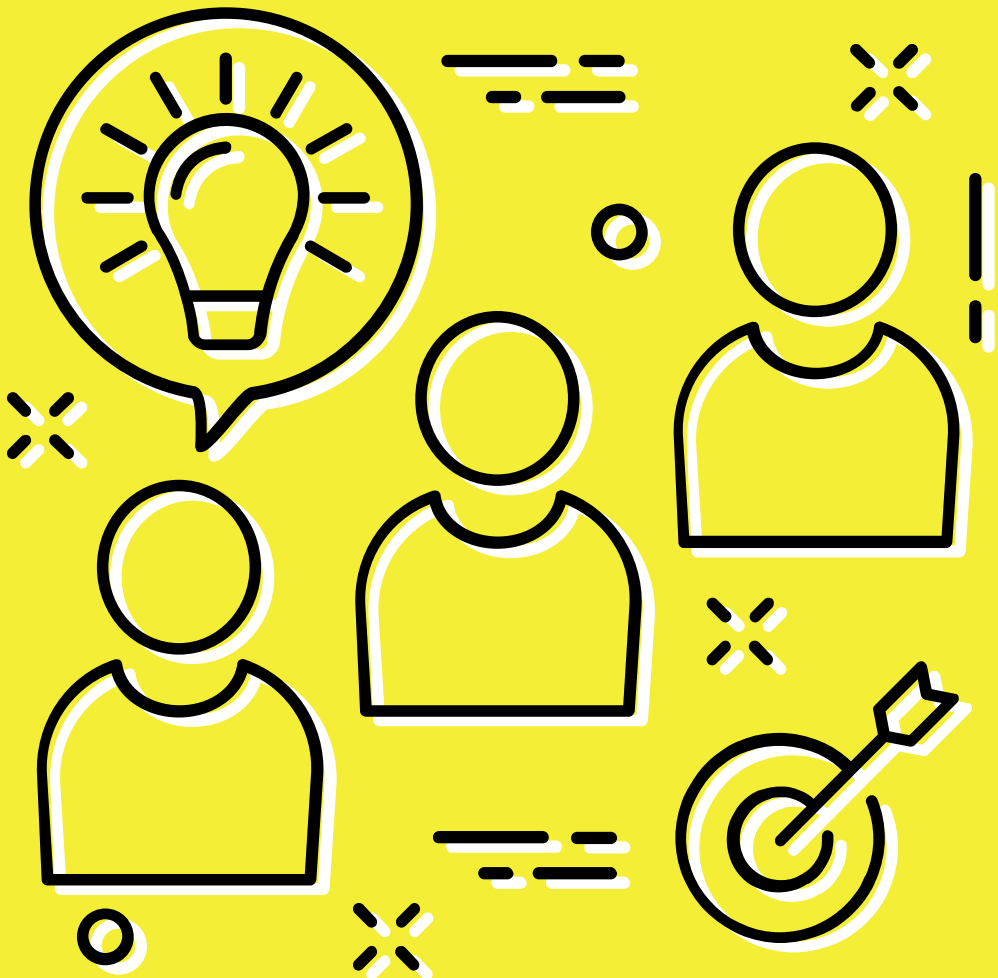
Active mood for a shared understanding

As also part of the facilitators' role, participants are put in an active state during the sessions. It enhances their willingness to participate, as well as set them into the "open mode" (MacKinnon, 1966). The tool should let participants free to move, and make the changes they are willing to do.

Next, these insights and conclusions from the context mapping are used to redefine the problem statement, creating a design goal for the project.

4 Solution direction

Previously, we gathered information about the current situation of a LEF Future Center's facilitation session. This chapter describes the solution directions for the perceived problems., which are here summarized. The design goal is to be found in the difference between the current and desired situations. It serves as a guide for the solution finding.



4.1. (Re)defining problem

As mentioned in the previous chapter, the context mapping lead to two pain points. They are interconnected, being one the cause of the other.

The misunderstanding of the revergence phase can lead to a messy final clustering

It is important to leave to the facilitator the role of choosing the appropriate techniques of a session, and they must have a wide variety of possibilities for each part. Even though at LEF they do clustering activities with participants (usually spontaneous or predefined clustering), the lack of separation between the reverging and the converging phases can cause a messy final clustering. After using different means of idea communication (post-its, whiteboards, blackboards), the selected ideas might be put back in a new format or in the way it is presented. This often contributes to a messy clusters' gathering by facilitators, which still need to be given to the problem owner.

The messy final clustering leads to a loss of creativity

The previously gathered clusters usually goes to the problem owner, who can better analyze the outcomes of the session. As it can be delivered in a messy way, the analyses of the clusters and ideas can also be problematic. Together with facilitators, the problem owners should analyze the session's outcomes, defining which direction is more efficient to the given problem. This is then affected, turning the analyses to be more complex than it should. If the clusters do not make sense for them, the individual ideas are also affected. As the sessions' outcomes are derived from these ideas, all the generated creativity can be lost.

4.1.a. Desired situation

How does the current situation relate back to the original assignment concerning participants' creativity in facilitation sessions? And in how can it be addressed?

It has been argued that visual representations derived from participants in facilitation sessions are their creative outcome, and is important to let them express their own ideas. Although participants usually think that they cannot draw, they might end up with sketches which represent their thoughts, and are easier to communicate with (Ware, 2008). Moreover, they make use of written expression as well, conveying a more complete message (Goldschmidt and Sever, 2010). Even though their individual ideas are an imperative part of the process, their final clusters are the most valuable outcome - and a final deliverable to the problem owner (client), which is done during the revergence phase. Consequently, the desired situation is based on the two problem statements previously stated.

Figure 18
An exemplified image of the messy final deliverables to client after a session.

Gathered from Voltage Control™

Embodying organization in clusters

As noticed, facilitators should be supported during the revergence phase of a session. By revisiting and rearrenging every option generated during the divergent thinking, the revergence phase aims to create a shared knowledge between participants (Heijne and Smit, 2018). Therefore, a tool should be designed to assist participants in idea clustering and supporting facilitators with that gathered outcomes. Since it is important for the latest part of delivering and communicating these to the problem owner, organization is necessary since the start.

With organized ideas clusters, the desired situation can also increase the perceived professionalism that LEF Future Center can offer during their facilitation sessions. A potential benefit of this can be the addition of how the ideas are conveyed to clients as part of the value offered by LEF.

4.1.b. Design goal

The design goal is the foundation for a valuable solution direction. It is formulated based on the aspect set for the desired situation: embodying organization in clusters. The design goal is thus as follows on the next page.

*"Support facilitators during sessions by bringing **organization to the revergence phase** to uphold creativity"*

4.2. Direction

In order to start prototyping, a frame was build according to the desired situation. The ideal frame is useful for solution finding.

Unification of phases

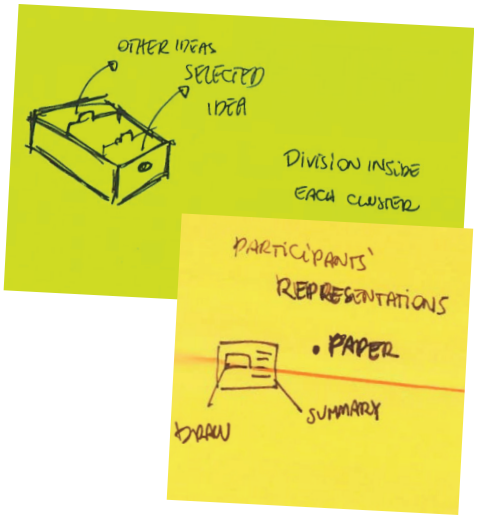
The idea of consolidating the divergence, revergence, and convergence phases reframes the disconnected activities into one outcome. To start making clusters can be hesitating, and therefore the design should be something that evokes participation from users.

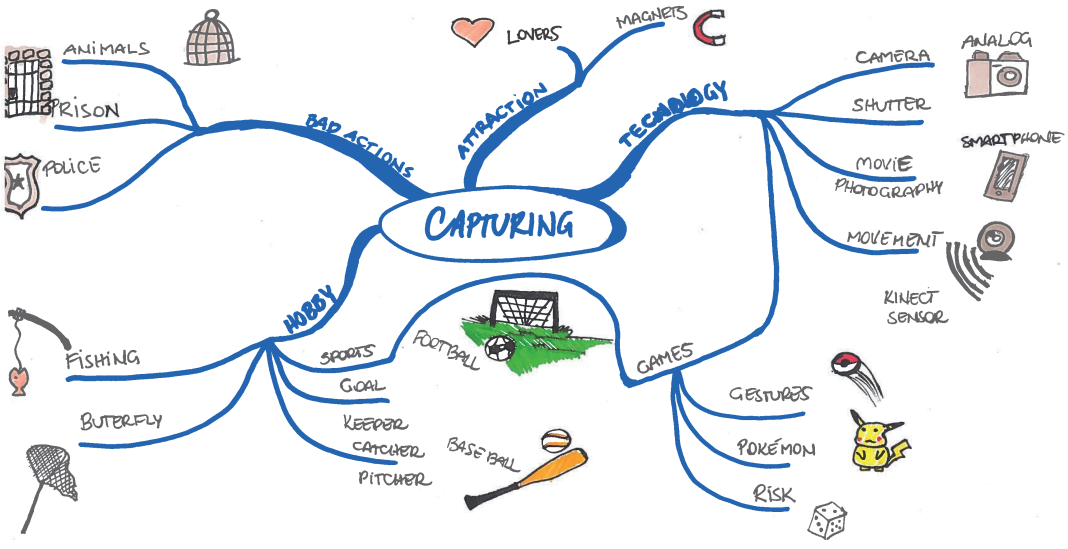
The outcome is the clusters itself, and these should be understandable and communicable to other stakeholders.

Then, this frame covers the construction of a shared knowledge between participants, which is the main goal of the reverging phase.

Exploration

After defining a direction, the need of exploring that frame in a concrete way emerges. Mind maps and different illustrations were made in the researcher's workbook, seeking the creation of different ideas that would combine phases (figure 19). These were very effective to explore solution directions, as well as to communicate the ideas to other people.





Figures 19 & 20
Sketches and midmap from idea generation.

Besides, creative sessions were held to start testing prototyping (chapter 5). In these, the given problems were matching the design goal and direction of the project's problem. By doing this, the researcher could not only perform explorative tests but also ideation together with other designers (figure 21).

Overall, the ideas generated from individual generation and sessions had two main cores: the sepparation between image and written summary, and the adaptation by participants. Consequently, the successive tested ideas were based on these cores.

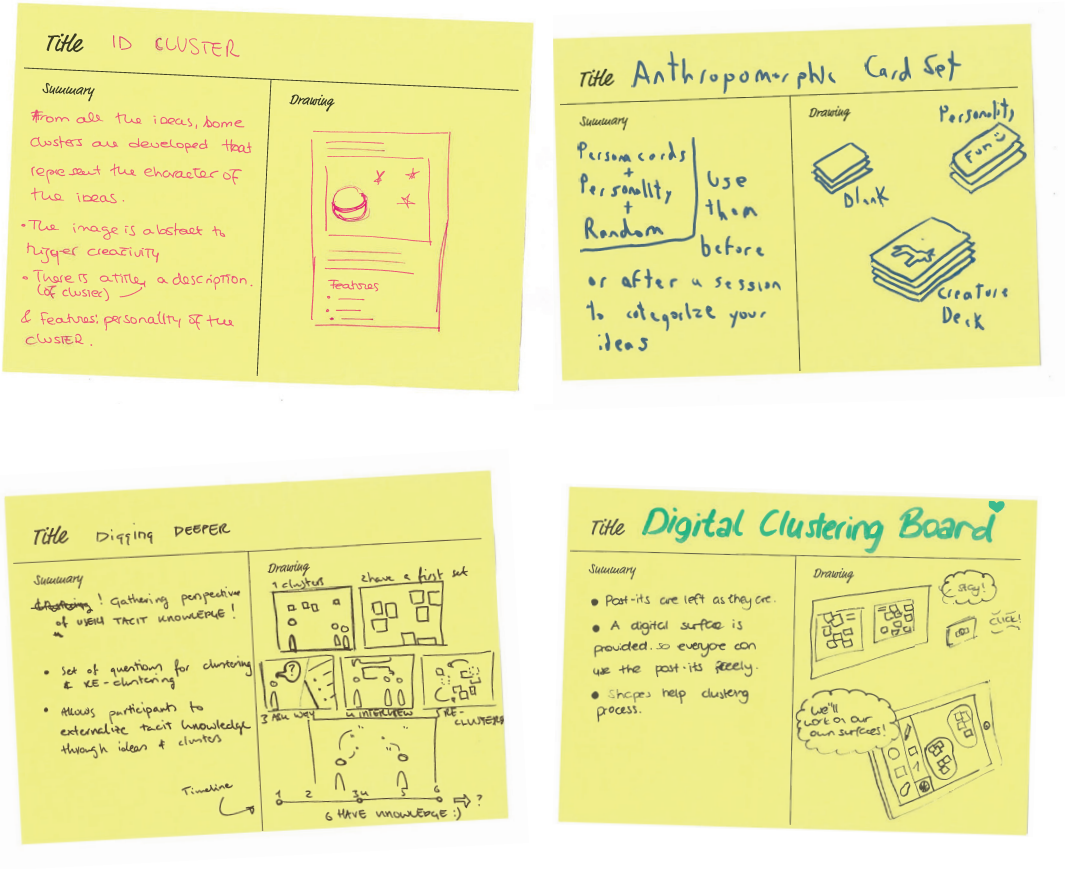


Figure 21
Results generated from creative sessions during the prototyping tests (chapter 5).

Criterias

Together with the exploration, the need for requirements also emerged. For this reason, five criterias were used in order to select the best ideas and keep it further with the exploration. These are:

- ***Feasibility:*** is it suitable to work on a creative session setup? What kind of extra materials would it need?
- ***Adjustability:*** how easy is for users to intervene in the design? Can the facilitators work with it?
- ***Supportive:*** how does the design support facilitators during revergence?
- ***Visual & textual:*** how does the design promotes a combined use of visuals and textual languages?
- ***Creativity upholder:*** how does the design upholds participants' creativity?

Scope

Making use of already known materials within LEF Future Center is chosen for keeping solutions exploration. Based on the pain points found earlier (page 64), which lead to the problem redefinition (page 70, the direction is then described as follows:

Let facilitators combine the three phases of a session, thereby providing participants with a different viewpoint of their own ideas, (re)creating new clusters in a way that helps them develop a shared knowledge in groups.

4.3. Conclusion

The hypothesis is that the design goal can be met with a tool that is aimed at supporting facilitators in combining the divergence and revergence phases of a session.

For that purpose, ideas that combine already used materials at LEF Future Center is preferable, taking into account that participants must be able to intervene in it.

To illustrate the evolution from the first problem definition (page 19) until the final design goal (page 73), a visualization is presented on the next page.

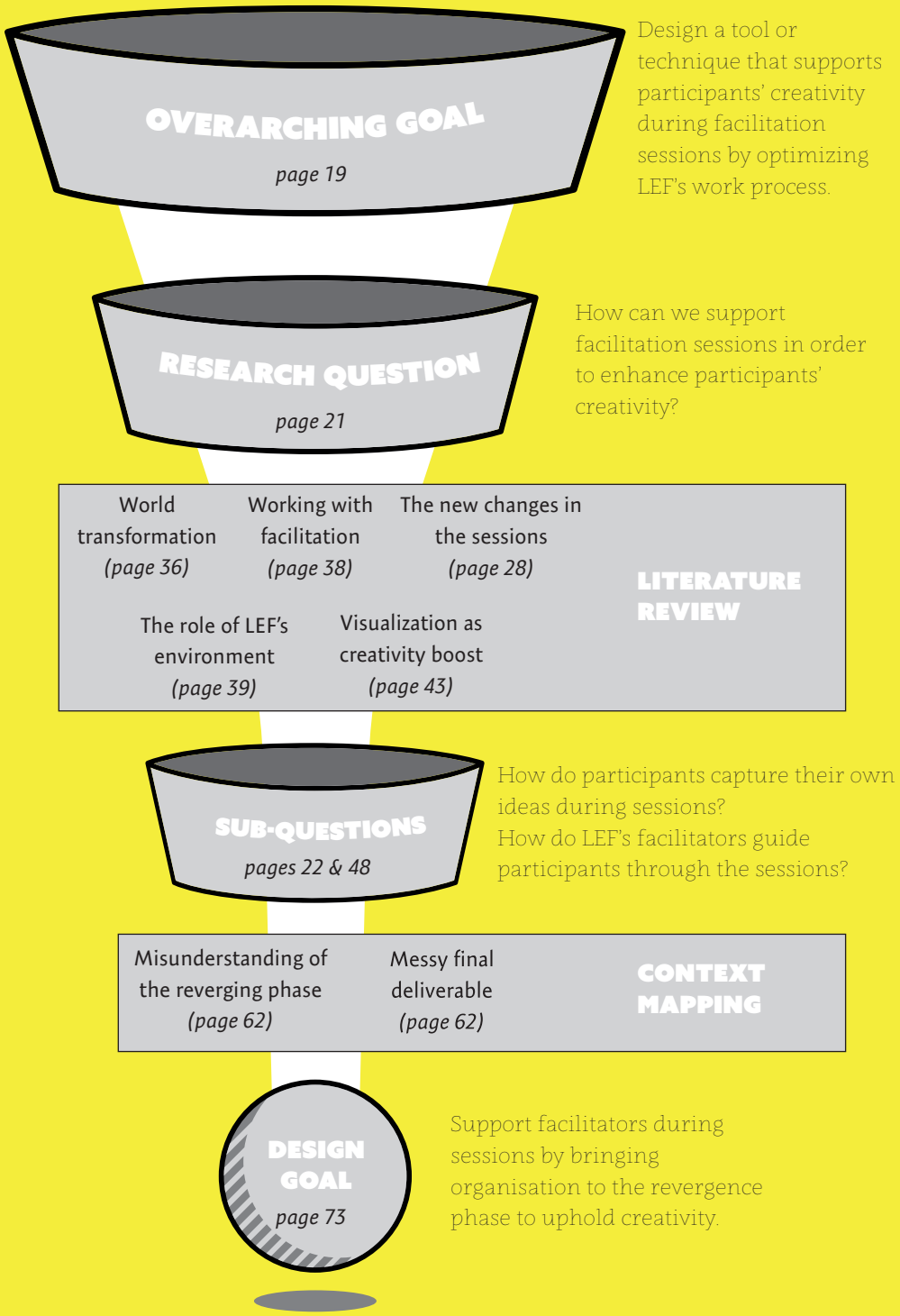


Figure 22
Visualization of the problem development, delving from the first goal to the final design goal.

5 Quick iterative protoyping

In order to discover how to best guide the creative sessions' participants through the reverging phase, quick iterative prototyping is used. Five prototypes were made and each one was tested within a creative session setup. During this process, it became clear what participants need from the tool as well as the facilitators' needs.

5.1. Introduction

The Interaction Prototyping and Evaluation (Boess, Pasman, and Mulder, 2010) is the chosen method to evaluate concepts and check if the researcher's assumptions are feasible or not. It was used low-fidelity prototypes that enable users to try and give space for them as much as in a real situation as possible. Because at that point of the research space where LEF Future Center uses for sessions was closed and under renovation, different creative sessions with four participants were performed at TU Delft to simulate the context. The full sessions' setup can be fund in Appendix E. By the end of the tests, details about the final concept were envisioned. Next, these tests sessions are described.

Figure 23
Student participating in the first test session.

Figure 24
Participants during a test session, using the sticking notes prototype.

5.2. Prototype test 1

Aim: *test the 'standardization' as a unification of the divergence and revergence phases.*

Participants: *four Industrial Design students.*

Procedure: *working as a facilitator of an ideation session, the researcher guided the participants during it. They were not told that it was a test session, and no instructions were given to use the prototype. Afterward, an interview and conversation with participants were held.*

The session

An ideation session was designed to test the prototype. By performing the three phases of a creative session - divergence, revergence, and convergence - the researcher could simulate the original setup of a session at LEF Future Center, and test the prototype within it. When performing the reverging phase, they were asked to be in groups of two. The ideation session served also to generate new ideas for the project. By bringing new people to the problem, new insights and ideas emerged. ***Problem:*** *how can we give structure to clustering during a session?*

Sticking note template

A template was designed and printed on square 75 x 75 mm sticking notes (figure 25). On that, a space for drawing and title were given.

Observations

The template on the sticking notes provides consistency to the divergence phase. Most of the time, participants were able to make sketches on the drawing space. Sometimes they preferred to give a small description instead of a sketch.

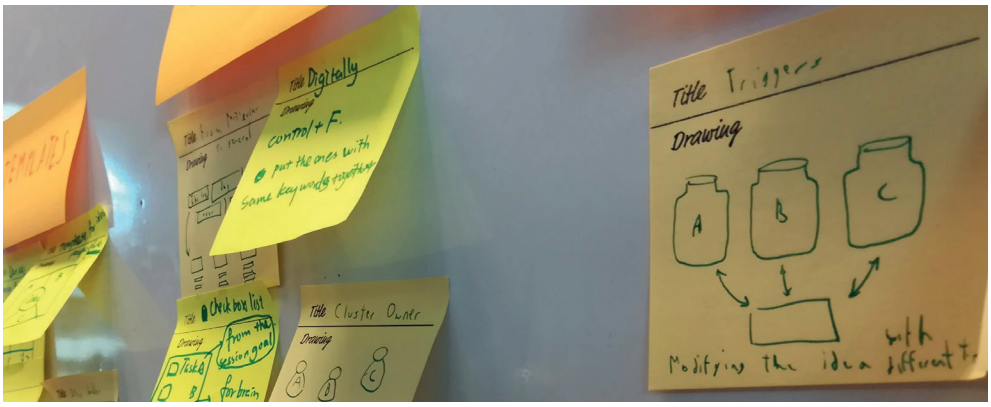


Figure 25
Sticking notes prototype from test 1, filled with participants' ideas.

One participant said: "It is nice to see the overall picture of the similarly filled post-its". This suggests the power of the standardization during the process.

Even though the divergence phase had consistency, the reverging phase was still not organized.

Evaluation

The templated sticking notes were not sufficient to give structure for the reverging phase but it was a starting point. Instead, it gave structure for the divergence phase. The next iteration should focus on the unification of these within the revergence phase. What if the participant is not used to make drawings? These participants are designers and are used to do so. Is there any difference between the number of ideas generated with the templated sticking note and a regular one?

5.3. Prototype test 2

Aim: *compare 'regular' ideation sticking notes with my concept prototype.*

Participants: *two Industrial Design students and two Civil Engineering students.*

Procedure: *working as a facilitator of an ideation session, the researcher guided the participants during it. This time they were told that it was a test session, and some instructions were given to use the prototypes. Afterward, an interview and conversation with participants were held and recorded.*

The session

An ideation session was designed to test the prototype. Also performing the three phases of a creative session - divergence, revergence, and convergence - the researcher could simulate the original setup of a session at LEF Future Center, and test the prototypes within it. When performing the reverging phase, they were asked to be in groups of two. The two Design students were provided with regular sticking notes and the other students with the templated ones. ***Problem:*** *how to make tacit knowledge emerge from clustering in sessions?*

Sticking note templates

Same from the previous test, a template was designed and printed on square 75 x 75 mm sticking notes (figure 26). On that, a space for drawing and title were given. Another template was created on a bigger sticking note (210 x 150 mm), with a place for drawing, title, and written summary (figure 29).

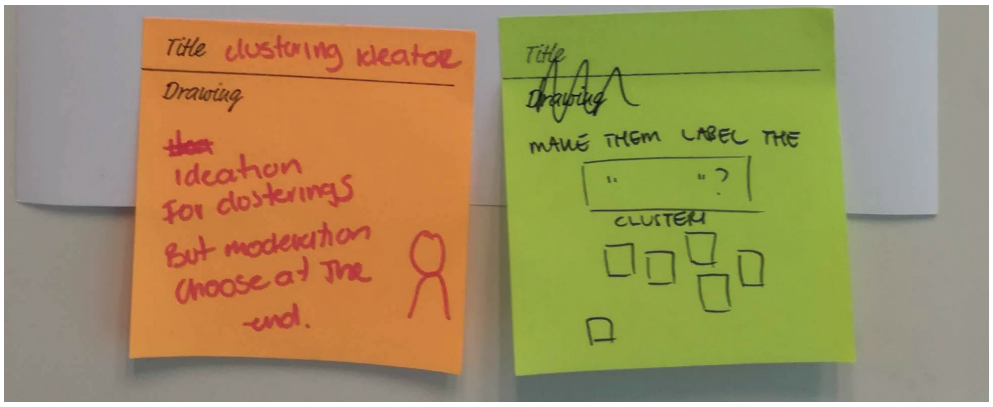


Figure 26
Sticking notes prototype from test 2, filled by participants.

Observations

The designers' team could generate more ideas with the regular sticking notes. It was 18 compared with the 10 ideas the other team generated.

One participant said: "The template was somehow limiting me but also good to make me think of a drawing and a title". This suggests that the standardization can be limiting and make participants think more about their ideas.

Although the designers' team generated more ideas, they were doing it mostly with descriptive words. The non-designers team had sketches on every sticking note. That can be a result of the division space in the prototype.

The bigger sticking note was handed into both groups during the convergence phase. It helped them to communicate and present their ideas to others.

Evaluation

This time the templated sticking notes confirmed the previous findings, is not sufficient to give structure for the reverging phase but for the divergence phase. Besides, it showed to be functional with non-designer participants as well, even though it can be limiting for them. How to overcome the possible limitations it can bring?

5.4. Prototype test 3

Aim: *test pictorial and written "personality" as clustering organization and association.*

Participants: *two Industrial Design students and two Civil Engineering students.*

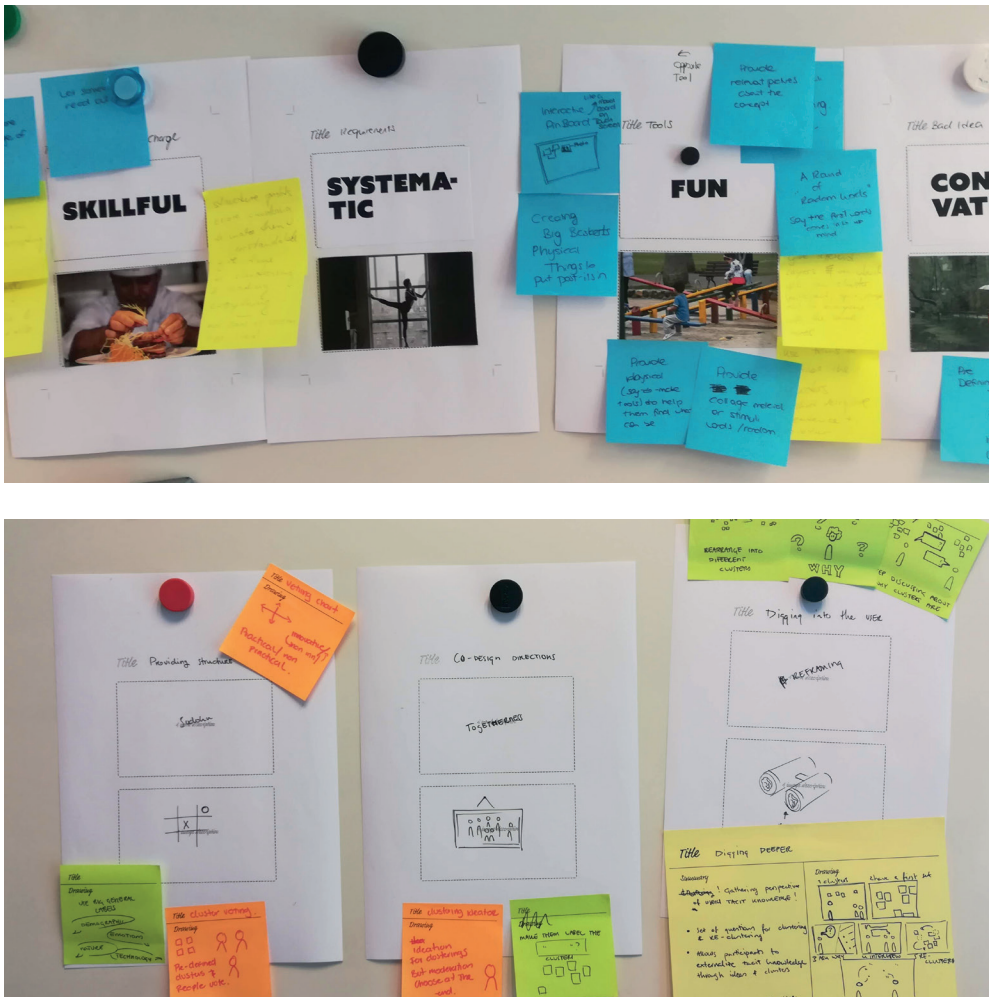
Procedure: *two types of clustering tool were designed. One with two sets of cards: word and image. Each of these had 15 options, that were previously selected based on duality, so the participants should give meaning to it. The other clustering tool had a similar design, but with no cards - participants should come up with the words and image. In both, the idea is to give personality to the generated clusters. When asked to perform the revergence phase, instructions were given to each group of participants separately.*

The session

Also during the previously mentioned session on test 2, the prototypes here presented were tested. When performing the reverging phase, they were asked to be in groups of two. The two Design students were provided with the clustering tool with the sets of cards, while the non-design students were provided with the open format, to observe if they would be able to give meaning to their clusters. The task was to create clusters within their groups' ideas previously generated.

Clustering templates

Two templates were designed and printed on an A4 format (figure 27). In both, there were spaces for a title, a word, and an image. The difference was that one had to use the given words and pictures cards, while the other group could draw and write themselves.



Figures 27 and 28
Clustering templates. On top, the one with given pictures and words cards. On the bottom, the other group's with drawings and words they did.

Observations

It was interesting to see that participants started to put the sticking notes directly in the clustering tool format (figure 28), even it was not asked from them.

One participant said: "I really don't like the word cards. We were just worried about selecting words. The other group had more freedom than us". This suggests that the cards did not work well for the clustering. Participants were not feeling stimulated by it.

The team with the open-format tool had made interesting drawings for their clustering. They used it to create an idea sketch that represents the clustering.

The title space is now taking less attention than the other spaces. It should be more prominent.

5.4.a. Converging tool

Together with this session, a converging tool was tested. It is a sitcking note template in a bigger size (150 x 200mm), with space for title, drawing, and summary (figure 29). Even though it helped participants to present one final idea, the tool did not have connection with the clusters' organization. As it is a step after the reverging, the clusters should be already organized when the converging phase starts.

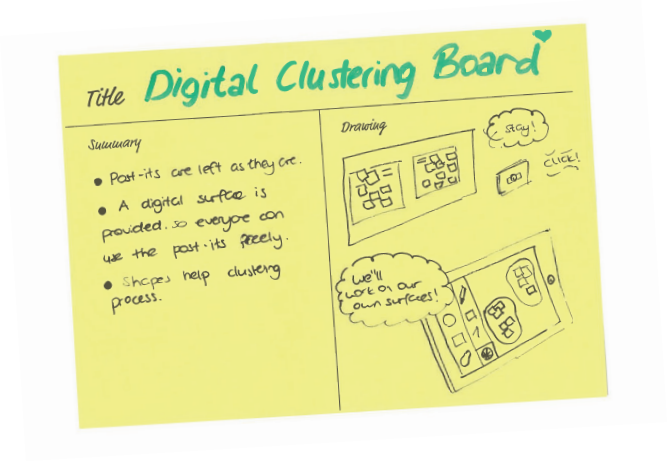


Figure 29
An example of the converging tool filled in by participants. The bigger size is better when presenting the contained information.

Evaluation

The ‘clustering personality’ words did not add much information nor help to participants during the session. Although, the images generated from the open format team resulted in good outcomes to communicate their clusters. Similar results from the images cards, but less powerful. The clusters organization did not come from the ‘personality’ but from the sticking notes attached to the provided clustering template. Moreover, the clustering tool did not asssit during for the clusters' organization, so it is decided to not be in the next tests, neither for the final concept.

After this test, it was clear that the effectiveness of this tool is with the combination of the divergence and revergence phases. The clustering template needs to be adaptive to the generated ideas during the first phase.

Figure 30
Students performing the reverging phase of the session. Here you can see they choosing the best pictures and words for their clusters.

5.5. Prototype test 4

Aim: *test the 'clustering template' as clustering organization & test the sticking note drawing and summary format.*

Participants: *two Industrial Design students.*

Procedure: *in this test, the previous idea of using a template for clustering was improved and printed on an A3 format (figure 33). Together with it, the used sticking notes were bigger (75 x 125mm), and the "title" space was substituted by a "summary" space. In the 'clustering template', three spaces were clearly defined: title, image description, and ideas. The assumption was that the users would place their sticking notes on the "idea" space, giving a title name and a new image to describe the cluster itself.*

The session

For this test, a smaller session was performed using two participants only. They were asked to individually diverge and after perform the revergence phase together. The divergence phase was skipped, as it would not interfere in the results.

Figure 31
Students performing the reverging phase of the session, using the provided clustering template.

Sticking note templates

The rectangle sticking note format (figure 32) was tested, as it gives more space for users draw and/or write. The "title" space was removed, as it was being used to actually write a summary of the idea. Instead, the new template embraces the "summary", giving a space for that. Together with it, an equivalent space for "drawing" was set.

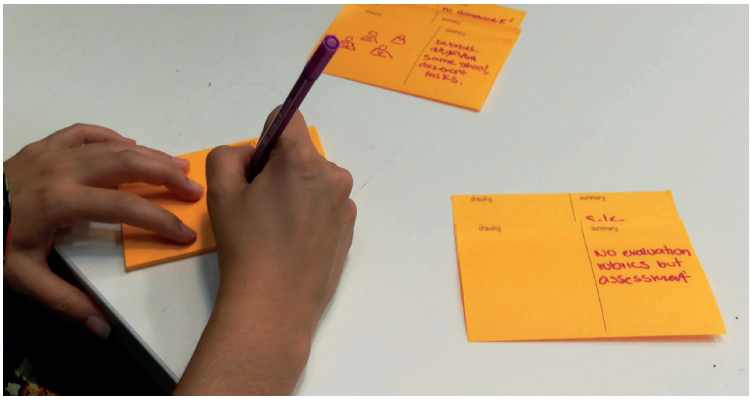


Figure 32
Close-up into the sticking note template. On the left side, a space for drawing. On right, a space for a written summary.

Clustering templates

Using an A3 paper format to print out the 'clustering template' (figure 33), a big space for "ideas" were given on the right side. On the left, a "title" and "image description" spaces were available.

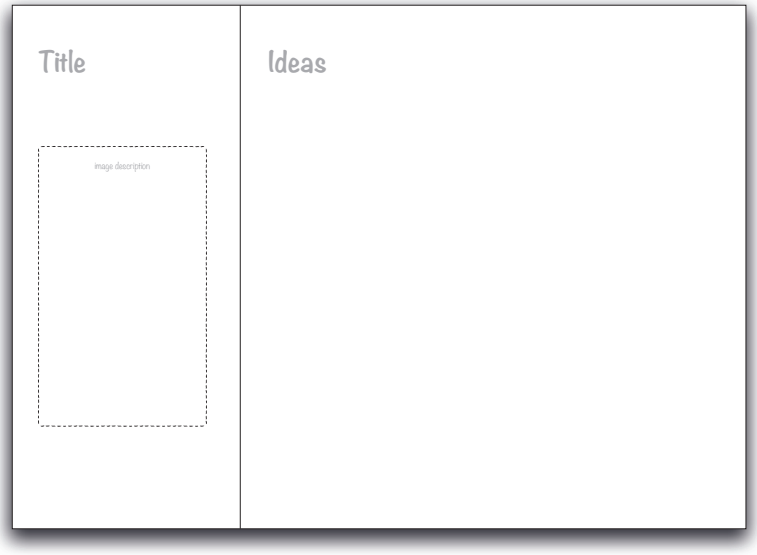


Figure 33
Visualization of the clusters' template.

Observations

The participants did not find any difficulty in completing the 'clustering template'. They did it before receiving the instructions.

Participants found the "descriptive image" for the clustering helpful to summarize the clusters' idea. In one of these, they also have written a short description of the image.

One participant said: "I liked to use these sticking notes... It gives me more structure and also instructions to put my ideas on paper, even though it's kind limiting". This suggests that the sticking notes template worked well to give participants instructions.

Even if it was simple sketching, every sticking note was filled with one drawing and a summary.

Evaluation

This test shows that the tool can be used even without a facilitator. It is positive, even though a facilitator is always needed during a creative session.

It becomes increasingly clear the necessity of a space for the generated sticking notes' ideas. It is only when these are gathered up that the group can further discuss each cluster and built a shared knowledge on that, which is exactly the purpose of the reverging phase. The space for a title and a descriptive image of the clusters assist participants to discuss its main idea, facilitating the process of constructing a shared knowledge between them.

As also observed in previous tests, the combination of the divergence and revergence phases are essential for the effectiveness of the tool. By creating a template for sticking notes and for the clusters, these should visually communicate with each other, so participants can understand not as different things but as a single and unified outcome. The final tool thus consists of five steps: idea generation (divergence); ideas discussion, clusters of ideas, name, and drawing (revergence).

5.6. Tests' conclusion

The main observations from the prototype tests are here summarized. Moreover, they are addresed based on the previously set criterias - feasability, adjustabiliy, supportive, visual & textual, and creativity upholder (page 83). The next step is to implement these into the concept design.

Combination is the key for organization

The divergence phase is the generation of ideas. The revergence phase is the rearrangement of these. Combining these phases is what brings organization to clusters, and it is the main structure of the tool, which uses basic materials available in sessions.

Standardization as structured communication

The sticking notes and clusters templates work as a standardization for the session process. It lets participants use the same means of communication for ideating and clustering, building a pattern for the session.

Limiting participants is not necessarily a bad thing

When using the templated sticking notes, participants may feel limited with the predetermined spaces for a drawing and a summary. However, this is what helped them to support both visual and tesxtual ideas.

The function of the design is to facilitate and systematize

As similar as a facilitation session itself, the design facilitates participants during the diverging and reverging phases. Not only, the facilitator felt supported by the tools, during and after the session. It was much simpler to look back at the clusters and ideas even when the session was over.

Concluding, the combination between divergence and revergence must be made with the use of two different tools. As during the converging phase clusters have been already done, it does not interfere in the clusters' organization. As the goal is to bring organization to clusters, the converging tool idea is then skiped.

Although the tests were performed into creative sessions set up, at LEF Future Center they usually have more participants per sessions, dividing into smaller groups of four to six people. Besides, participants are effectively using the tested tools but the success of the concept is also within facilitators' use - they are the ones selecting tools for the sessions. In these tests, the researcher was the facilitator, so it is important to still evaluate with other facilitators. The next step is to merge these conclusions and insights into a design concept that are also appealing for them.

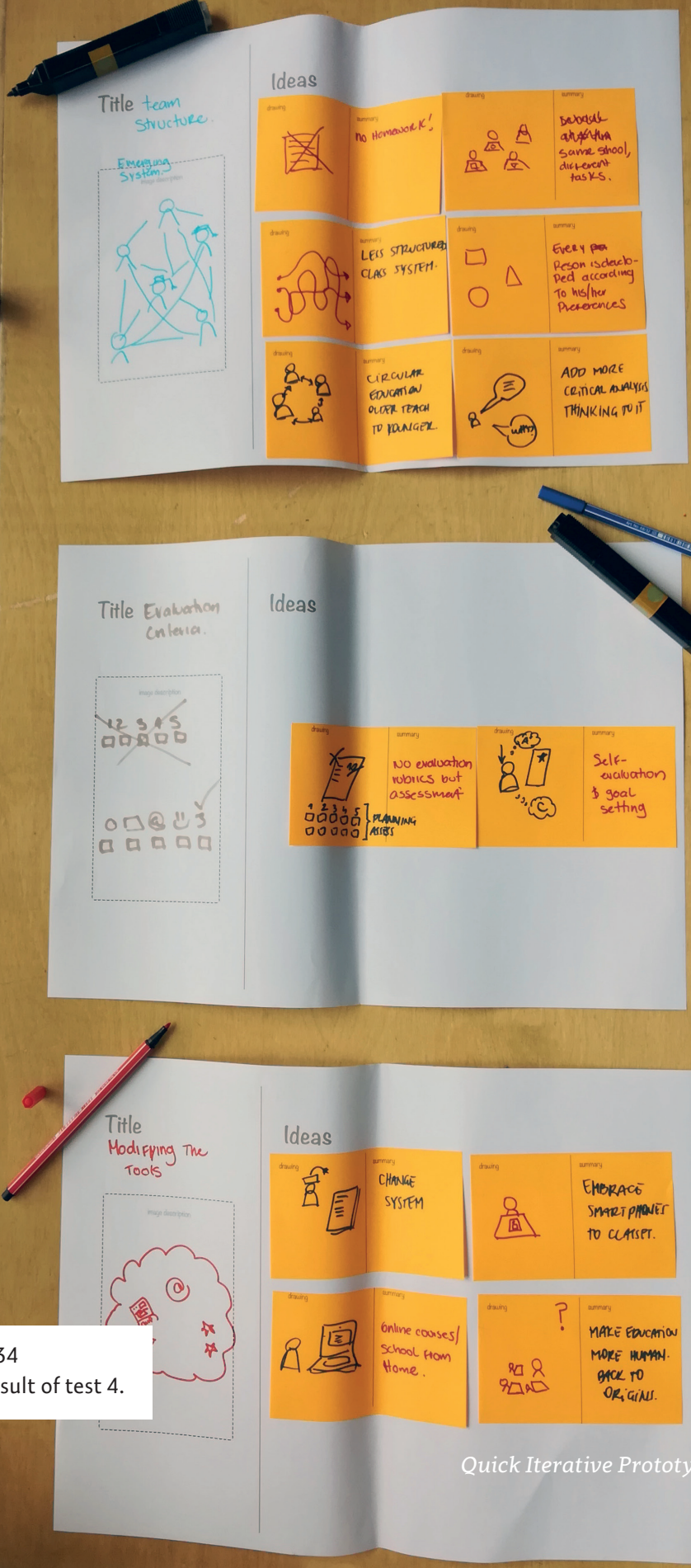
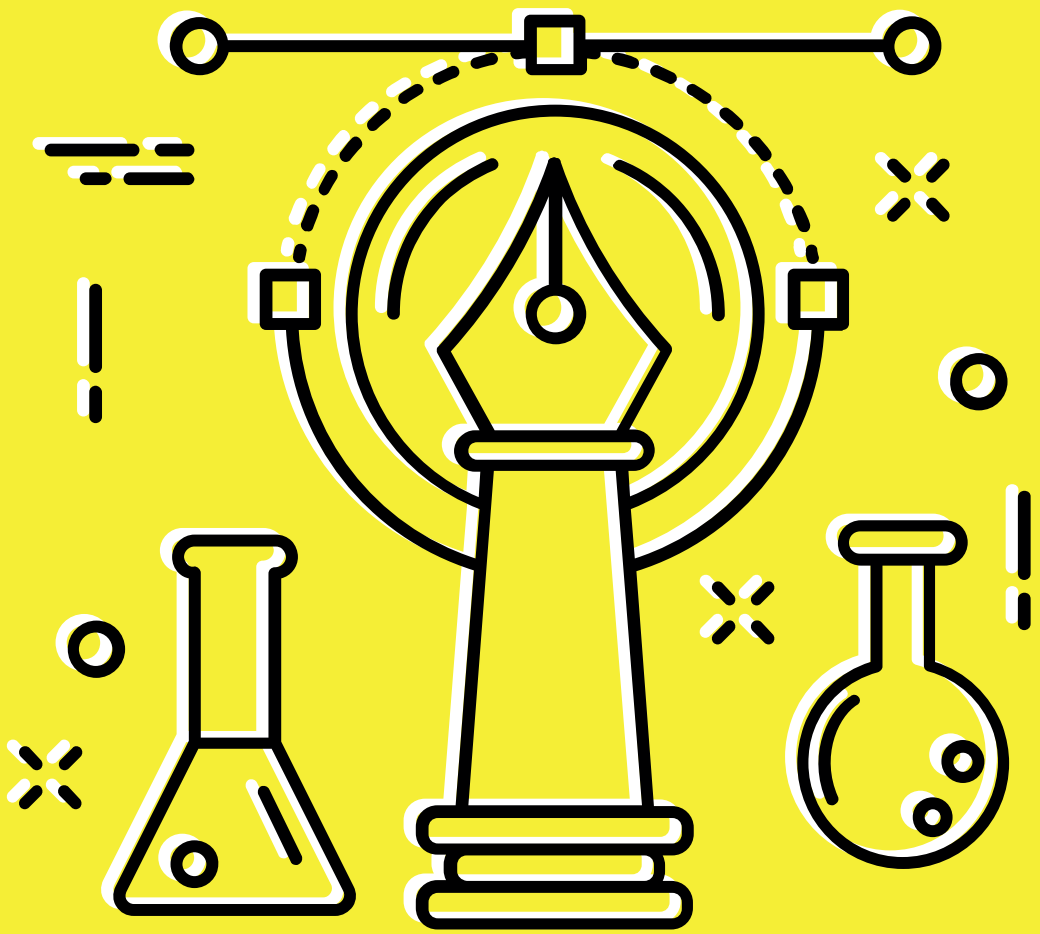


Figure 34
Final result of test 4.

6 Concept Design

In the previous chapter, we have discussed the importance of the reverging phase during a creative facilitation session. Moreover, a tool that supports facilitators during that step was developed, focusing on the ability of participants to build an organized shared knowledge. In this chapter, the result of the studies is presented in a structured tool, that shows promise of achieving the design goal and accomplishment of the assignment.



6.1. Clustering with visuals

Using drawings and sketching to represent the clusters showed to be opportune to convey the clusters' idea. Most importantly, to assist participants in building a shared knowledge. During the iterative prototyping, practical tools were used to facilitate the connection between the divergence and revergence phases in sessions, designed pointedly to let participants build a shared knowledge on their ideas using visuals.

6.1.a. Learning from Computer Science

Within the Computer Science discipline, clustering is useful for several exploratory data analysis and grouping (Jain, Murty and Flynn, 2000). Most of the clustering projects from Computer Science is based on gathered data, and have the role of visualizing a big picture of the information. For creating a pattern from the data, different computer software and algorithms can be used to create a cluster.

Figure 35
Languages are clustered and visualized as black dots on the map, to visualize them in numbers and where it is agglomerated.

Regarding the creation of a pattern, the clustering activity involves different steps. One of these is data abstraction, where a representation of a data set is extracted and simplified (Jain and Dubes, 1988). This extracted data can be a description of the cluster, for example. This concept can be implemented within the reverging tool and was perceived during the quick iterative prototyping tests as a good approach for representing a cluster.

6.1.b. Abstracting the cluster

The goal is to let participants, after the cluster is done, to represent it using a drawing. When doing clustering activities in creative sessions, it is common to give them titles, representing each cluster with a name. Reiterating the findings from the literature research, written and visual representations are stronger when combined to convey a message.

When performing the cluster in a group, discussions about the ideas and topic emerge. This is part of the process and mostly done with conversations between participants. The shared knowledge is built upon that, and later ideas are gathered into groups. It is after this discussion that the abstraction can be made.

With the iterative prototyping test, two different ways of abstraction coulbe be observed:

- ***Combining ideas into a new one:*** using a combination of different ideas from participants, merging into one new idea.
- ***Giving a meaning to cluster:*** using visuals to represent the cluster's overall meaning.

Both ways of visualization are valuable, facilitating the communication of the cluster between participants, and enhancing their shared knowledge on the topic.

6.2. Clustalk toolkit

We now have the main principles described, the next part is to proceed with the concept design. This section describes the reason behind the name "Clustalk", and each detail of the toolkit. It is important to highlight that the design concept is based on the creation of clusters using the spontaneous clustering approach, which is considered to be the most adaptable by participants and facilitators, if necessary.

Introduction

A toolkit is "a set of tools designed to be used together or for a particular purpose" (Collins English Dictionary). The name *"Clustalk"* is a conjunction between the words cluster and talk, playing with the overall idea of the concept. The toolkit is meant to give facilitators an extra support when performing the reverging phase in a creative session, enabling participants to build a shared knowledge.

Clustalk is divided using the three different ways of thinking of a creative session: divergence, revergence, and convergence. Even though a converging tool is not presented, the phase should be mentioned, so facilitators understand the session should continue. *Clustalk* gives facilitators two different tools to use in the first two phases. The objective is to give organization to the created clusters during the reverging phase, and it does it by combining the ideas generated during the divergence phase. As each facilitator have their own experiences and preferences, the toolkit provides freedom for them to keep using their preferred methods and activities, using objects that are commonly found in creative sessions.

Steps and tools

Clustalk's sticking notes

The first phase of a session is consisted of letting participants generate as many ideas as possible. Here, the facilitator can find a templated sticking note, specially designed to enable participants to express their ideas using not words but also drawings. It is a simple division in the notes, where the words "drawing" and "summary" are printed. The main idea is to let participants generate new ideas using both means, enhancing their communication.

Clustalk's template

The main purpose of the revergence phase is to enable the shared knowledge between participants, and it is recommended to be formed using smaller groups of four to six participants. In rough means, it is the step when clusters are categorized, using the previously generated ideas. In this part, the facilitator finds printed out templates to assist during the phase. As it is easy to replicate, it is also possible for the facilitator to reproduce the content of the template in other bigger means, as whiteboards, flip-boards, and paper rolls. This is especially valuable when the session has a greater number of participants, causing also a bigger number of generated ideas.

The template is designed separating three spaces for the creation of a cluster:

- ***Ideas:*** is where participants can gather their clustered ideas into one space.
- ***Portrait:*** a space for the cluster's abstraction, using visual representations. It can be a meaning for the cluster or even a completely new idea, generated from the combination of previous ones.
- ***Title:*** as the name already says, it is a space where participants give a title for the cluster, representing it with words.

When to use

Clustalk toolkit is meant for creative facilitators that want to give more structure to the step in between the divergence and convergence phases of a session. Ideally, it can be used at any possible problem-solving sessions, and still gives them the freedom to chose their preferred methods and activities for the session.

Extras

Besides the toolkit, the facilitator would still need to use other tools that are commonly found during these kinds of sessions. These can be:

- Whiteboards, blackboards, flip-boards;
- Markers, pens, pencil;
- Papers.

Figure 36
Clustalk prototype placed at LEF Future Center.

6.3. Embodiment

The toolkit consists of two different tools, that are used at different times during a session. In order to give facilitators the opportunity to properly use it, basic instructions are also necessary. This means that facilitators need the toolkit to be informative.

The tools are designed based on the fourth session of the iterative prototyping. Besides the criteria, four principles are used to find an appropriate form for the toolkit, which can be seen in figure 36.

Handy

As facilitators already have a big demand for the sessions' development, ease of use increases their retention for the toolkit. The toolkit should be available for facilitators to check at any time of their sessions' creation.

Reasons & instructions

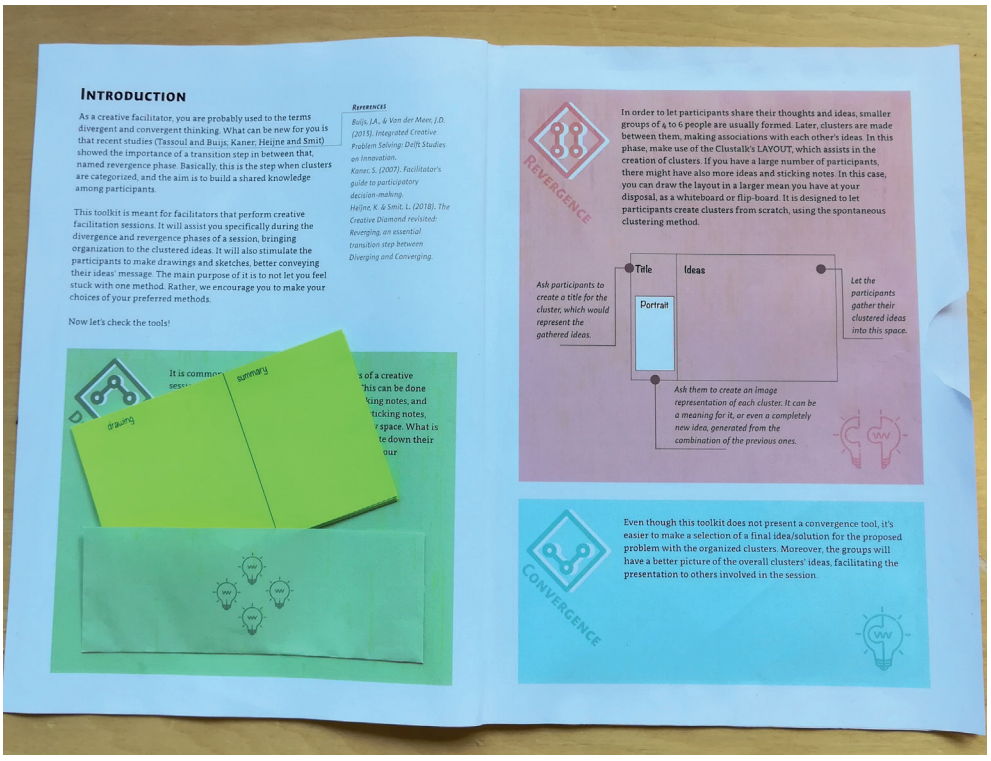
Because many facilitators may not be aware of the importance of distinguishing the step between the divergent and convergent thinking, it is important to let them know the reason the toolkit was created. This means that a summary of what is the revergence phase, as well as simple instructions to use the tools, must be given to them.

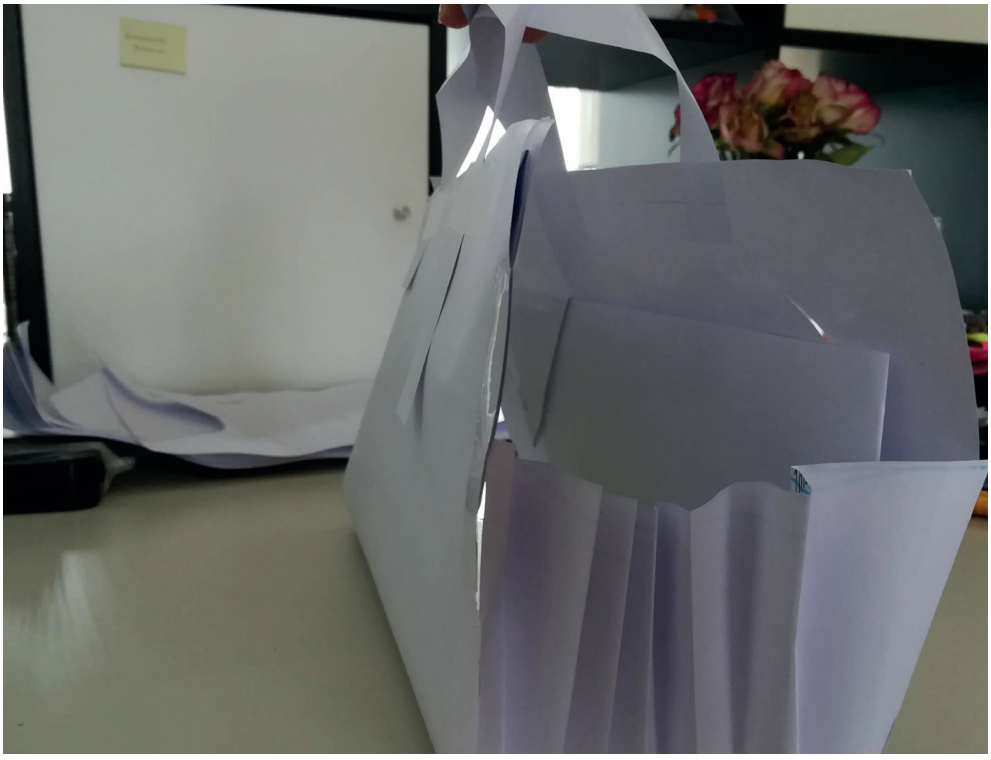
Tools availability

The toolkit should make the proposed tools available to facilitators. It is important to contain both tools in it.

Open for facilitators' methods

Considering that every facilitator has his/her own preferences and expertise about the sessions, different methods and activities are already applied by them. The provided tools should work within the context of these many possibilities available.





Figures 37 and 38
Different paper prototypes built during the process.

Ideation

Different ideas were drawn and built, as shown in figures 37 and 38. Starting with the design of each tool, and giving a body for their combination. For the sticking notes template, it was considered the best option to keep as a sticking note, as there were no much room to change that. For the clusters' tool, paper rolls were considered because it is easier to have a personalized size but it is bulky and difficult to carry, if needed. It was decided to have it as an A3 template, and as it is intend to be easy to replicate, it is also possible to print any time at LEF Future Center.

A folder was considered to be as the toolkit, because of its easiness to carry and capability to hold different things inside. Eventually, the selected and developed idea was a toolkit's box, where the tools would be placed inside that. The introduction to the topic and instructions are printed directly to it. The box can be carried out with the facilitator at any moment, and, when they are used to the tools, they can also just bring those with them. At LEF, they already have a furniture full of shelves (figure 39), especially to put different boxes with tools - as markers, sticking notes, papers, and magnets. The Clustalk toolkit can be placed in this, so it is easy for facilitators to locate it. The layout of the box can be found in Appendix F.

Figure 39
In the middle, Clustalk is placed at LEF's space, together with other tools.

Figures 40 and 41
The first depicts an example of a facilitator grabing the Clustalk from the shelf. Below, an image with the box opened, revelaing the instructions and tools.

6.4. Conclusion

Even though creative sessions' participants will be using the tools, the success of these also depends on the facilitators' use. A toolkit has been added, in order to effectively support facilitators during the revergence phase of their sessions. This was done by combining clusters' abstraction and visual representation, leading to the Clustalk toolkit. A box was designed to combine the tools, together with a summary of the revergence's importance, a well as instructions. Now that the toolkit has been defined into a final concept, the next step is to perform validation tests, based on the previously defined creteria.

Figure 42
The *Clustalk's* box closed.

7 Evaluation

In this chapter, the toolkit is validated and further recommendations are provided. Based on the set of criteria developed in chapter 4 (page 83), tests were performed in a real-life context at LEF Future Center.

7.1. Introduction

The quick iterative prototyping suggests that the tools have potential benefit for sessions' participants. The Clustalk toolkit, on the other hand, is meant to make these tools available for facilitators, as they are the ones choosing the best options for participants. The goal of this study is to evaluate the Clustalk toolkit with experienced facilitators at LEF.

Procedure

Two evaluation sessions were performed together with 14 LEF's facilitators, being 7 men and 7 women, from ages 32 to 55 years old, and different experience time working as facilitators.

The evaluation was performed as two 40 minutes workshop, with 7 participants in each one. It was simulated a creative session setup ("mini-session"), and one of them were asked to play the role of the "facilitator", while the others could be the "participants". The given problem was an easy task, and not related to the project: "how each person can boost energy at work?". It was chosen for an easy problem just to set participants' mood during the workshop, as the content of the session is not relevant for the evaluation. The goal was to let them experience by themselves how a session with the Clustalk toolkit can be done.

For the facilitators, the Clustalk toolkit was given three minutes before the beginning, so they could check what it is, and how to perform the mini-session. This part took 20 minutes from each workshop. After, another 20 minutes were given to discuss the revergence phase, as well as about the toolkit. This was also the part where the participants were interviewed, and questions were built based on the conversation with them.

In the end, a questionnaire was handed in (Appendix G), and the questions were as follow:

- How would you describe these tools in comparison with a regular session setup?
- Did you feel supported by the tools during the process? How?
- Can you describe how easy or difficult was to create clusters? *(for "participants" only)*
- Can you describe how easy or difficult was to gather the clustered ideas? *(for "facilitators" only)*
- Would you say you have created more drawings than in a regular session? Why?
- Do you see yourself using one Clustalk during a session? Why?
- What would you like to be different in the Clustalk? Why?

Figure 43
Facilitators during the evaluation session, presenting their clusters with the given tools.

7.2. Key findings

The prototype was evaluated based on the criteria set on page 83:

· ***Feasibility:*** is it suitable to work on a creative session setup? What kind of extra materials would it need?

· ***Adjustability:*** how easy is for users to intervene in the design? Can the facilitators work with it?

· ***Supportive:*** how does the design support facilitators during revergence?

· ***Visual & textual:*** how does the design promote a combined use of visuals and textual languages?

· ***Creativity upholder:*** how does the design uphold participants' creativity?

Drawings are made when asked

It was interesting to observe that participants made drawings only when the sticking note asks, so in the regular sticking notes there were no sketches. Besides, the clusters' drawings were perceived as the best addition, and they all created new ideas to represent these. The amount of space and user cue was enough for them to complete the cluster layout without hesitation. However, the word "portrait" in the cluster's layout was misleading some participants.

Connection to convergence

In one of the mini-sessions, the one who was playing the role as "facilitator" gave instructions to participants present in 10 seconds their clusters. After, he let them vote for their preferred clusters, giving each one 3 possible votes. This is known as the "hits" or "dots" (Buijs and van der Meer, 2013) convergence method. Even it was not asked to perform convergent thinking, he affirmed it was a natural process to continue.

Easiness

After the workshop, three facilitators asked to have the toolkit, and said: "I don't need the instructions now, just the layout printed". They affirmed it was a natural and easy way to perform the revergence phase, and they would like to have that option with them. The instructions were necessary only once.

Materials quantity

There were not enough Clustalk's sticking notes, and regular ones that are available at LEF's space were also used. As not every idea on sticking notes was being represented with a drawing, it was observed that the ones with sketches were more easily identified by participants, who could communicate those faster.

Flexibility

If the number of printed layouts are not enough, facilitators should also print these themselves. It has been found that they must have at hand the tools when they need, before or during a session.

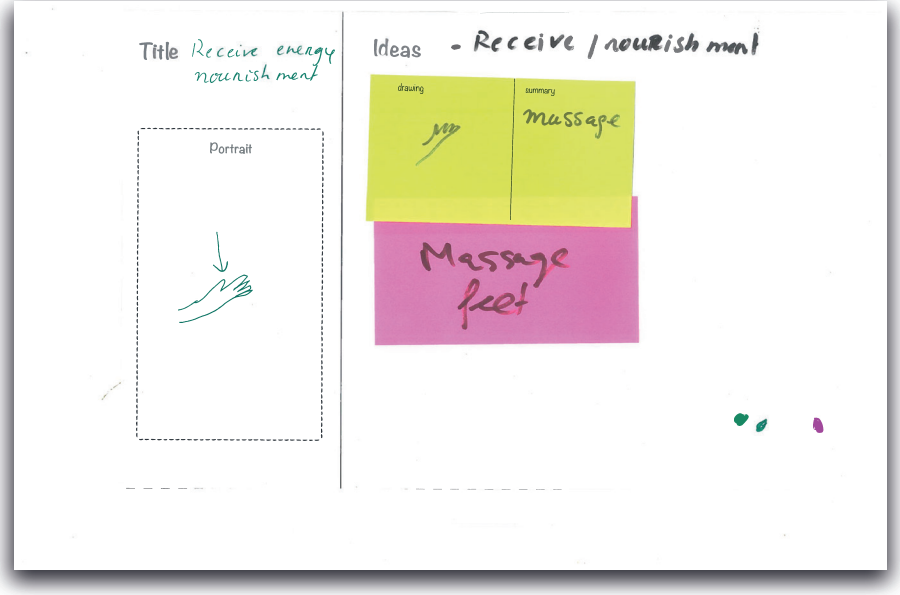


Figure 44
Example of one of the clusters created, with 3 dots as a converging method.

7.2.a. Discussion

The evaluation session was thought to be a workshop about the revergence phase, so facilitators also gain more knowledge on the phase. When performing the mini-session, they could understand the goal of the toolkit, as well as its value. After reading once the information contained in the toolkit, they were already introduced to the main goal of the revergence phase and were able to understand it clearly.

The tools contained in Clustalk were directly correlated with the distinct phases. However, some facilitators doubted the usefulness of the templated sticking notes. They argued that they prefer to let participants shout out the maximum number of ideas during the divergent thinking. Indeed, the Clustalk's sticking notes take more time for participants to complete, because it is asked of them to make a drawing. Nevertheless, during the quick iterative prototyping and evaluation sessions were clear that these drawings add valuable content for participants' ideas - are easier to communicate, also facilitating later the process of creating a shared knowledge.

The clusters' tool was perceived as a good addition to the creative process. However, some of the facilitators argued that it was somehow similar to an already existing tool, from The Institute of Cultural Affairs (ICA). As they presented, ICA's tool also gives space for participants to create clusters with a title but not using visualization. When searching for the tool, the researcher found that it is presented as part of ICA's courses for facilitators, and it is available only if you attend one of the courses. For this reason, it was difficult to add that as benchmarking.

During the evaluation "mini-sessions", the ones in the facilitators' role had no much difficulty to understand the overall idea of the Clustalk. They were not feeling limited by the provided tools, and different methods were used in the two sessions, confirming the adjustability and support of the toolkit.

7.3. Recommendations

Toolkit

Above all, Clustalk demonstrated to be a valuable addition to facilitators' work, and for participants' input in the sessions. The evaluation sessions were performed in context with facilitators only, and it is also important to also test in a real-life session. From the evaluation sessions, some changes can be added to improve the toolkit:

Digital version: it is important for facilitators to have the toolkit available when they want. For this reason, a digital version of the Clustalk could be delivered to every participant. Not only, a QR code can be added to the physical product, linking to the digital document.

User cues: some participants were taking the "portrait" word literally, and this can easily be adjusted with a change in the name for "drawing", "visual" or "sketch".

Convergence tool: the final design does not present a convergence tool. As tested during the quick iterative prototyping, the clusters' organization was possible until the execution of the revergence phase. Nevertheless, the ideated design for convergent (figure 29) was a great plus that could be added in the toolkit. Besides, it can also be added a space for the "hits" converging method, as done in one of the evaluation sessions.

Further investigations

As discussed during the literature review (chapter 2), the transition phase between divergent and convergent thinking is still being under research. Further studies have to be conducted in order to better understand the revergent thinking. In this project, we added a reverging activity during sessions. It is recommended to develop studies comparing groups with and without the activity. How different would be the sessions' outcomes?

What can LEF Future Center learn?

LEF Future Center already have much knowledge and research done within the facilitation sessions. They know how to use their space and facilitators to give a great session and experience for the participants, especially focusing on divergent and convergent thinking. Further investigations on can be done within the revergent thinking: what are the best room setup for revergence? Do the participants have a preference for a specific furniture when reverging?

During the project time, it was clear that the client (problem owner) may have influence over the session setup, and can ask to finish the session during the divergence phase. It is important to understand that this choice may influence the final sessions' outcome. One possible suggestion can be to improve the communication between LEF and clients, showing the importance of having a complete session setup.

7.4. Limitations

This project was conducted over a period of five months. The researcher had time to better define the problem, tackling in one specific point in a facilitation session - the revergence phase. Another researcher might have emphasized different parts, resulting in a different outcome. Nevertheless, another researcher from TU Delft, specialized in creative facilitation and the revergent thinking, was consulted during this time, supporting the project.

During the empirical studies in the context, four facilitators accepted to be interviewed. It can happen that a certain type of person is more willing to participate than others. They were from different backgrounds and have their own preferences to perform a session, being difficult to trace a pattern in their behavior. Besides, when the observations in sessions were held in Dutch, the content of the session was not being taken into account.

Within the project period, LEF Future Center facilities have been closed for two months to renovate their space. This leads to some changes in the process, especially during the iterative prototyping tests (chapter 5). The tests were performed with a majority of Industrial Design Engineering students. Besides, as it was not inside LEF's context, the different used environments can also have influence over the results.

Due to time restrictions and availability of LEF's facilitators, it was possible to validate the toolkit with them on a simulation of a session. To understand if and how the toolkit really works, it is advised to perform validation tests in a real session setting, incorporating every stakeholder on it.

7.5. Conclusions

To conclude, we must look back at the proposed design goal - "support facilitators during sessions by bringing organization to the revergence phase to uphold creativity". Is it answered with the designed toolkit?

It is possible to affirm that the proposed design - Clustalk - assist in the organization of the clusters generated during the reverging phase. Facilitators were able to easily gather the clustered ideas after the sessions. To incentive participants to create drawings during the whole session showed to be a good way to uphold creativity. Moreover, it increases the facilitators' awareness for the revergence step, explaining its difference from divergence and convergence phases. These conclusions could be drawn because the final evaluation tests were performed with LEF's facilitators and their space, giving more trustworthy results.

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Appendices

Glossary

Facilitation session

Sessions where a group of people come together to think about solutions to a given problem.

Facilitator

Person who works performing facilitation sessions, performing activities with participants.

Participants

People who are invited to join facilitation sessions.

Problem owner

The client involved in a session's problem, who has the problem.

"the space"

It is how LEF Future Center names their environment, where sessions are held.

Creativity

“the generation of products or ideas that are both novel and appropriate” (Hennessey and Amabile, p.570, 2010).

Innovation

“successful implementation of creative ideas” (Hennessey and Amabile, p.585, 2010).

Divergence

Phase where thinking of the maximum possible solutions to deliver the proposed task.

Revergence

Phase in-between divergence and convergence, where a shared understanding about the content is built.

Convergence

Phase where evaluating, judging and selecting the most authentic ideas happen.

Clustering

Technique that can be used during the revergent phase.

Visualization

Technique to create drawings, images or sketches, in order to communicate a message.

Appendix A: Interview guide

Interview Guide

Style: semistructured formal interview. Although the questions are previously established, it is not necessarily leading the conversation. By the end, the interviewees should give answers to all of these.

Goal: To understand how facilitators guide participants during sessions. How do they use "de box" tools provided by LEF?

Hypothesis: Stimulate visual thinking is an important part, letting participants being more creative.

Method

Time: max. 50 minutes.

Documentation: Voice recording and facilitation session timeline.
The use of a sintetizing tool as the timeline facilitate to talk with participants about the topic. It also allows them to better describe their process, enabling the outcomes to be easily evaluated.

Processing: The recording is used to later make summarizing notes and insightful quotes. There is no need to make a full transcript of it.

To keep in mind: It's important that the interviewees don't feel like I am assessing them. Make sure to mention that they're not being evaluated.

Participants

Formed by LEF facilitators, the participants are hired by LEF as freelancers and work for specific cases. Usually, they have their own company, and work at LEF when sessions are performed. The facilitators also came from different study backgrounds, as Psychology, Industrial Design, and Communication. The in-house oldest are working for LEF for XX years, and the newer for XX years.

Questions

1. Think of a recent facilitation session you guided at LEF. It's important that it had involved the three phases - divergence, clustering, and convergence.
2. Shortly describe the phases you took to get to the final result.
3. Indicate these on the provided timeline .
4. How did you feel about the session?
5. Did you use any tools provided by "de box"? If so, which?
6. If positive, indicate in the timeline when did you use it.
7. For what reason did you use these tools?
8. How did they help you?
9. Quickly draw in the timeline the three phases of the creative diamond: divergence, clustering, and convergence.
10. Can you remember when participants were more creative? Please indicate in the timeline.
11. Why do you think they were more creative at that point?
12. Which tools did they use to express their ideas?
13. Do you feel that they have a preference for a specific tool? If so, which one?
14. Do you feel that some participants feel apprehensive to express their ideas?
15. What do you usually do to overcome that?
16. Where in the process you think participants should be the most creative?
17. Can you think of a metaphor for this particular session you have guided?

LEF's facilitators interview

Interviewee number: 1

Participant

Name: Ingrid Renirie

Age: 54

Time in LEF: 10 years

Discussed session

Project name (optional): _____

Duration: _____

Number of participants: _____

LEF's facilitators interview

Interviewee number: 2

Participant

Name: nel mostel

Age: 57

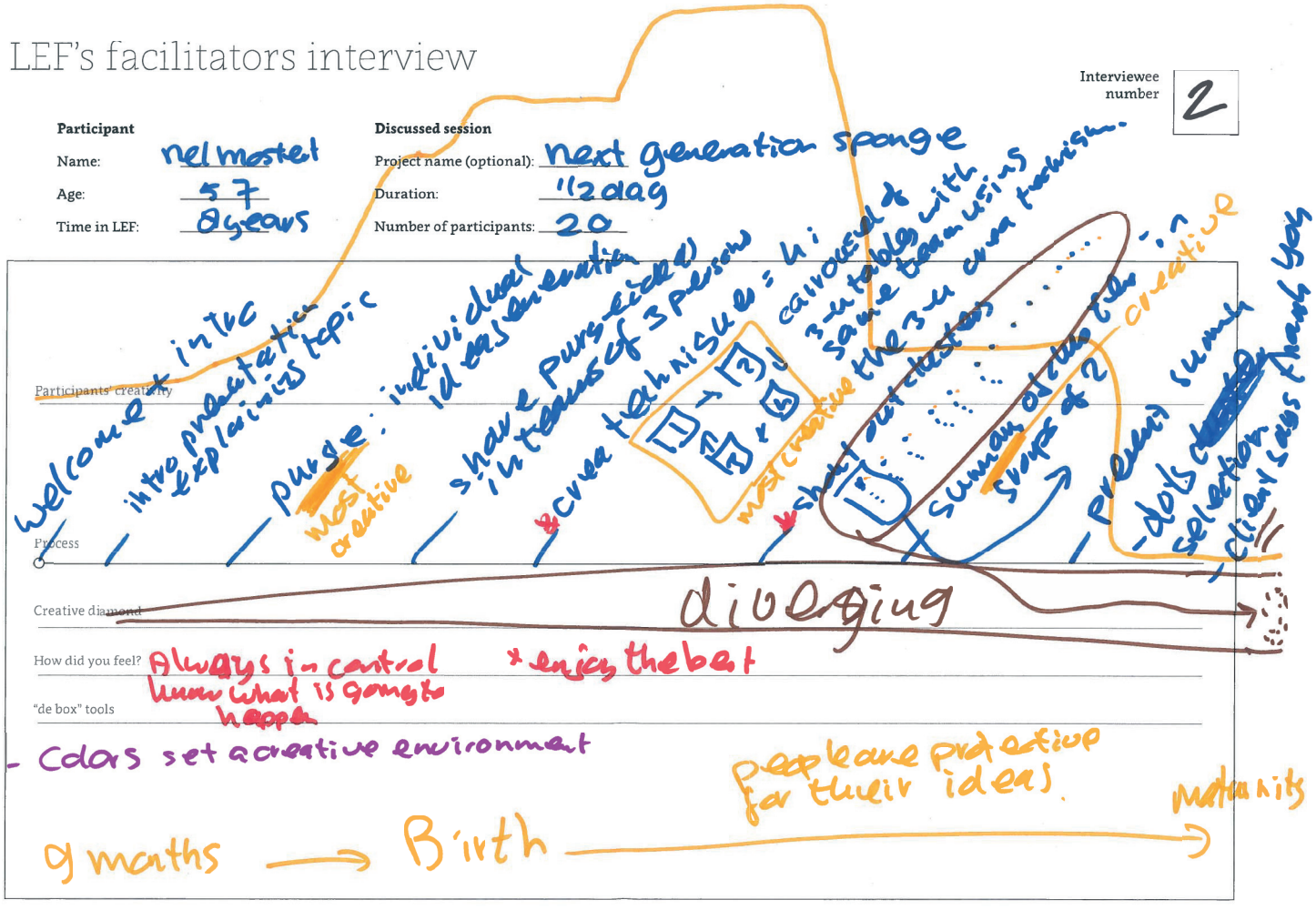
Time in LEF: 8 years

Discussed session

Project name (optional): next generation sponge

Duration: 1 1/2 dag

Number of participants: 20



LEF's facilitators interview

Interviewee number: 3

Participant

Name: MARINDA

Age: _____

Time in LEF: 3 jaar

Discussed session

Project name (optional): ACHTERDEURS

Duration: 16:00 – 20:00

Number of participants: 25/30

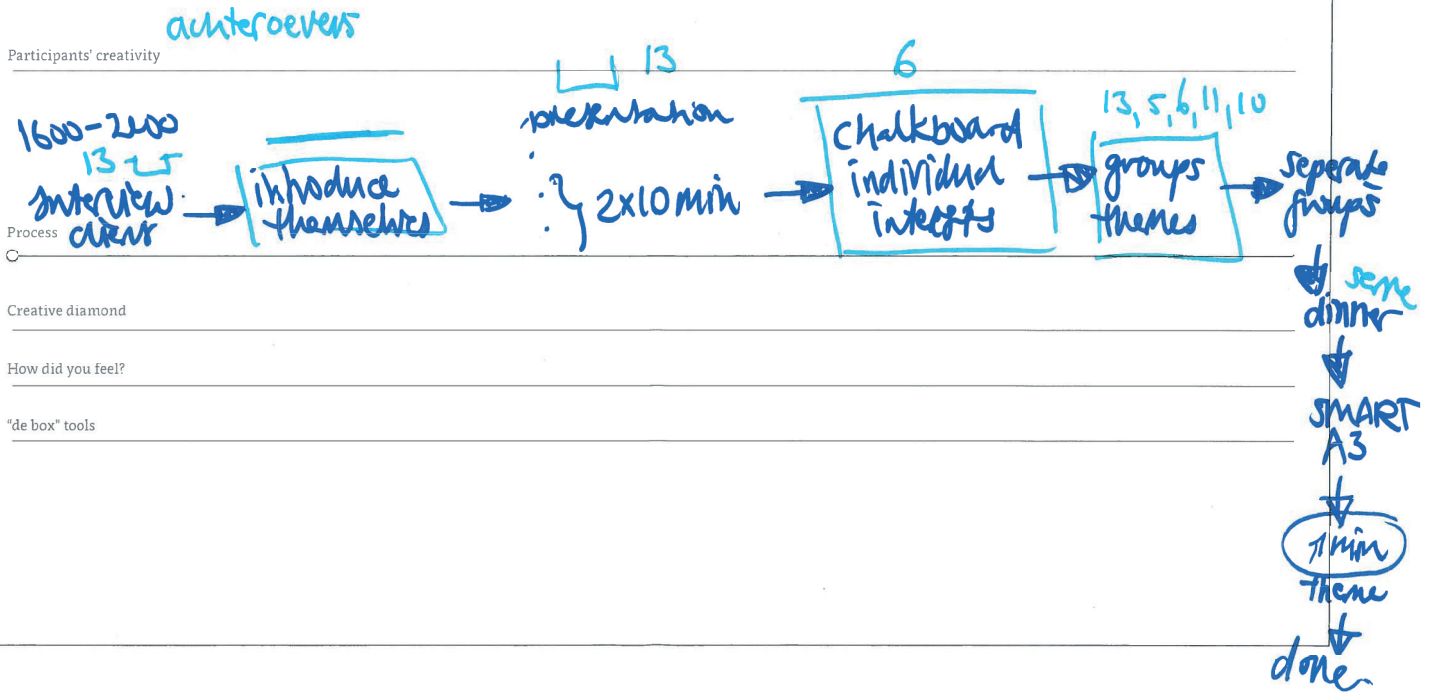
Participants' creativity

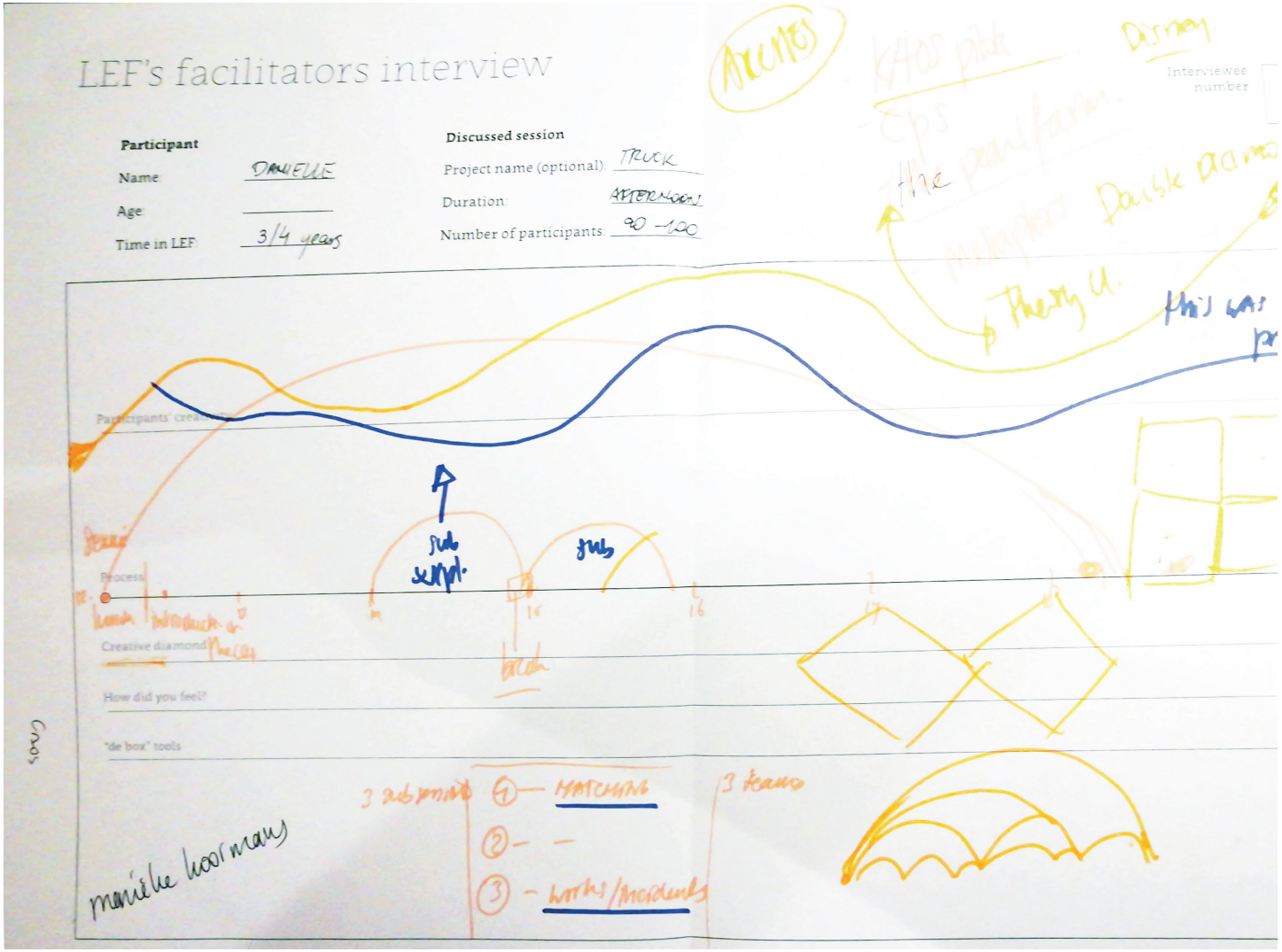
Process

Creative diamond

How did you feel?

"de box" tools




LEF's facilitators interview
Participant
Name:
Age:
Time in LEF:
Discussed session
Project name (optional):
Duration:
Number of participants:
Interviewee number
Participants' creativity
Process
Creative diamond
How did you feel?
"de box" tools
Theory U.

Appendix C: Interviews' consent form

Recording Consent Form

I am voluntarily taking part in a research study conducted by Renan Jordano, as part of the graduation project within TU Delft and LEF Future Center. I understand that my participation will be recorded on digital audio and that I will be photographed.

I understand that data and information I share today will be handled confidentially and anonymously.

I understand that the audio recordings and photographs will not be used for any commercial purposes whatsoever. The audio recordings and photographs may be part of information presented at educational and professional conferences.

I will not be identified by name or by showing my face. My personal information will be protected; taking part in this study and the results from the study are not part of my performance review. My information will be rolled up with the rest of the data from the other study participants.

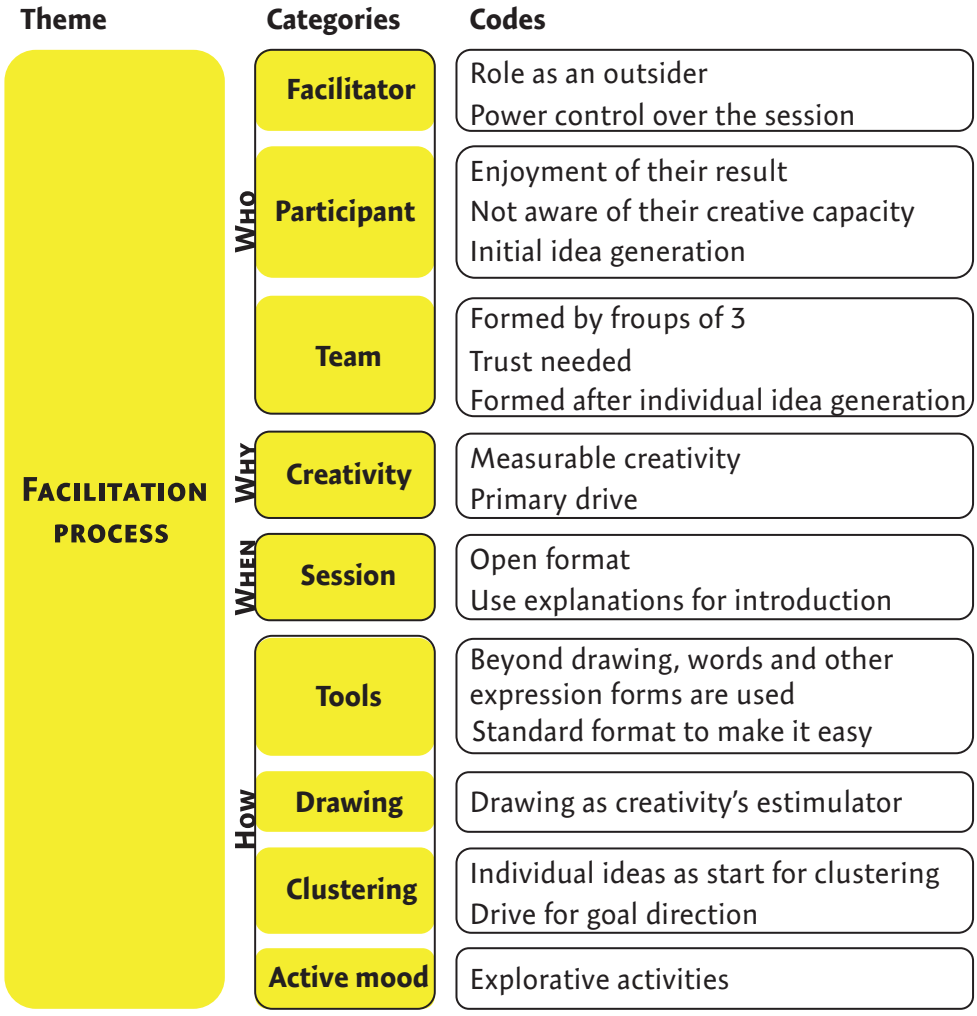
I waive any right that I may have to inspect or approve the final recordings, photos and report. I discharge the student Renan Jordano, from the faculty Industrial Design Engineering from any liability for making, editing or using the recordings and photographs from this study according to the uses outlined above.

Signature: 

Name: Ingrid Renirie

Date: 22-5-2018

Appendix D - Coding structure for context mapping interviews



Appendix E - Iterative Prototyping setup

Brainstorming session - 13/07

18:00 Thank everyone for the participation.

18:05 Bring them to context “Can you think of previous sessions (like this) you have participated? What went well and what went not so good on it? Why?” Let participants share their experiences.

18:15 Challenge introduction ***“How can we give structure to clustering during a session?”*** | “How can we merge the outcomes of the divergence and clustering steps of a session?”

18:15 First individual idea generation

18:35 BREAK

18:40 Reverging scaling approach by feasibility (most feasible - less feasible) & let them cluster spontaneously

18:50 Use big post-it to present the best ideas (in groups of 2)

18:55 Presentation of ideas

19:00 Wrap up & finish

19:05 Evaluation of the post-it idea

EVALUATION

Aim: test the ‘standardization’ as an unification of the divergence and revergence phases.
My first idea was to provide post-its like this to participants since the beginning of the session. Do you think it would help to bring organization in the clustering part? How? Why? Something missing?

OUTCOMES

Good to start testing. Still a simple design.
It does give a standardization (template) but only for divergence phase. Need something more to be used together during revergence.
The template brings organization but now is focusing more on divergence.
Good to have a “title" space! Participants were thinking in that as well, not only on the drawing.

Creative testing session - 20/07

15:30 Thank everyone for the participation.

15:35 Homework “Can you think of previous sessions (like this) you have participated? What went well and what went not so good on it? Why?” Let participants share their experiences.

15:45 Challenge introduction ***“How to make tacit knowledge emerge from clustering in sessions?”***

15:55 First individual idea generation

16:10 Divide into 2 groups of 2

16:10 Let them share their ideas in couples.
Group A: clustering tool; Group B: clustering tool with cards.

16:20 BREAK

16:25 Select ideas & use big post-it generate new idea

16:35 Presentation of ideas

16:40 Wrap up & finish

16:45 Evaluation of the post-it idea

17:00 FINISH

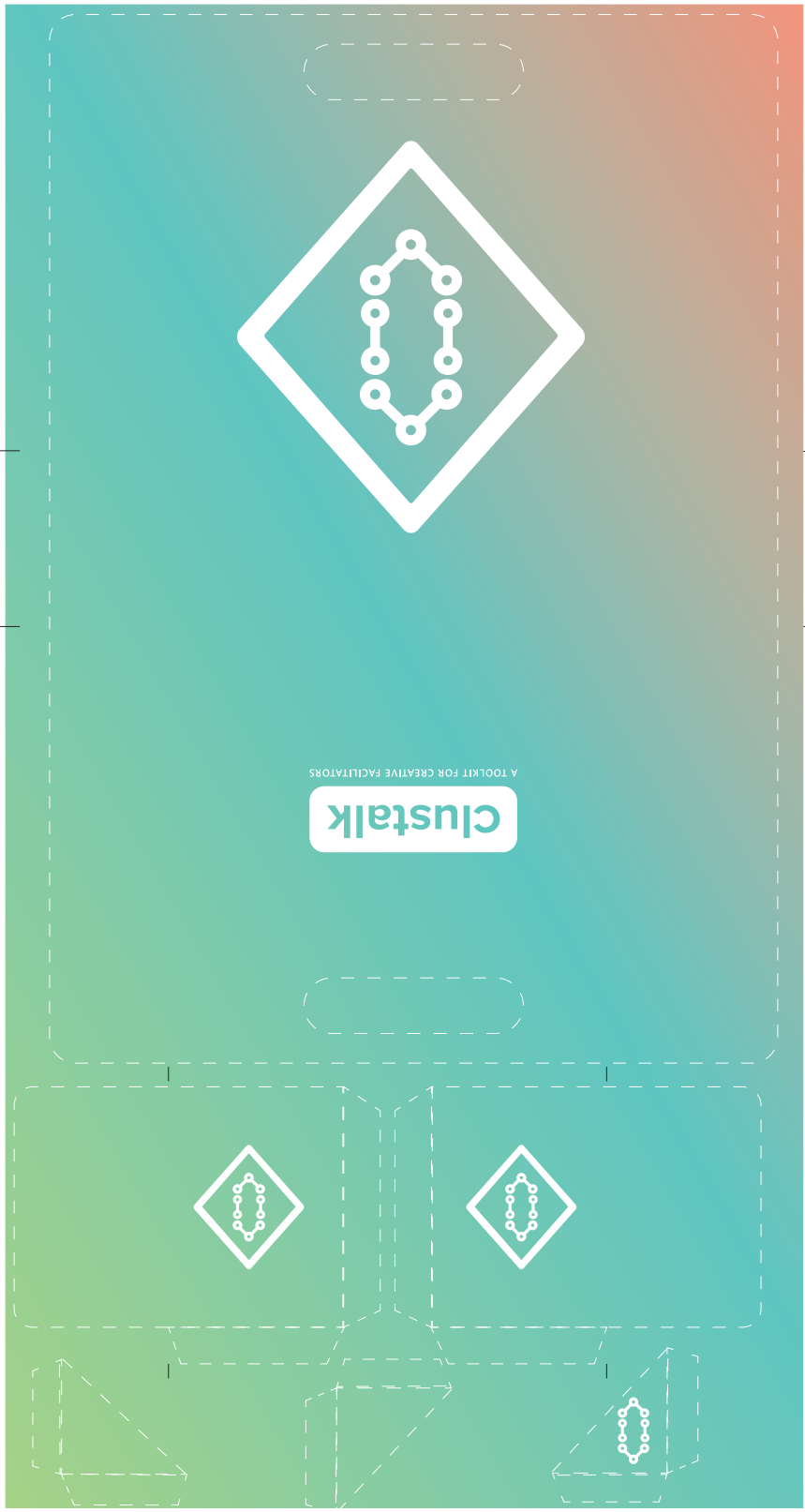
Testing session - 27/07

2 participants non-session setup
Give participants a task - How education can be changed for the next decade?
Divergence - Let them put their thoughts on the sticking notes
Revergence - Can you make clusters out of it? How would it be?

EVALUATION
Aim 1: test the sticking note drawing & summary format
Aim 2: test the 'clustering cards' as clustering organization

Questions
Everyone
In what way did the post-its changed your normal way of ideating? Why?
How difficult it was to make the clusters?
What did you miss most when making clusters?
How helpful was it to structure your ideas? Why?
How did you feel when drawing for the clusters? Why?

Appendix F - Prototype print layout

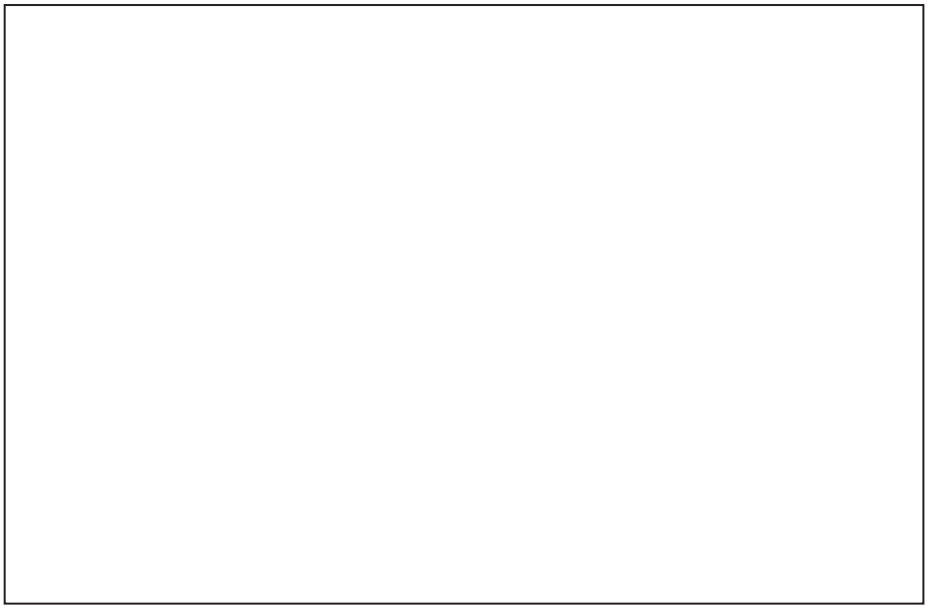


Appendix G - Evaluation questionnaire - participants

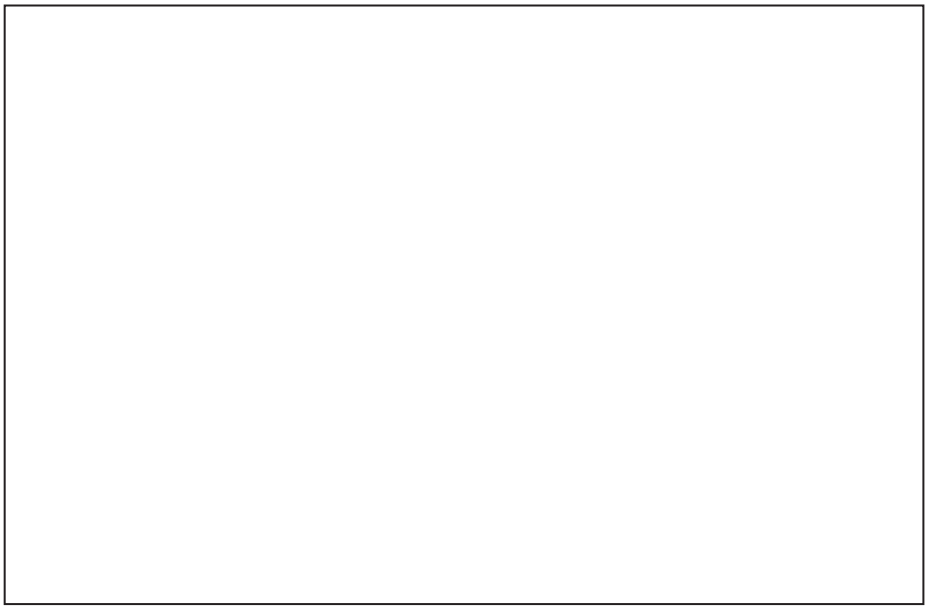
HOW WOULD YOU DESCRIBE THESE TOOLS IN COMPARISON WITH A REGULAR SESSION SETUP?

DID YOU FEEL SUPPORTED BY THE TOOLS DURING THE PROCESS? HOW?

Can you describe how easy or difficult was to create clusters?



Would you say you have created more drawings than in a regular session?



Do you see yourself caring one clustalk to use during a session? Why?

What would you like to be different in the clustalk? Why?

Appendix G - Evaluation questionnaire - facilitators

HOW WOULD YOU DESCRIBE THESE TOOLS IN COMPARISON WITH A REGULAR SESSION SETUP?

DID YOU FEEL SUPPORTED BY THE TOOLKIT DURING THE PROCESS? HOW?

CAN YOU DESCRIBE HOW EASY OR DIFFICULT WAS TO GATHER THE CLUSTERED IDEAS?

DO YOU SEE YOURSELF CARING ONE CLUSTALK TO USE DURING A SESSION? WHY?

What would you like to be different in the Clustalk? Why?