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## SHARED MEMORY IN DESIGN COMPLEXITY

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### ABSTRACT

This paper discusses the idea of how collaborative learning might help designers with the rapid learning required in the increasingly complex environments they work in. It has been proposed that innovation that drive technological advancement happens through evolutionary variation of the existing knowledge. The relevance of such an approach is that rapid learning is essential for a designer in a technological environment that is increasingly complex. The goal of the systemic design approach that addresses rapid learning is to facilitate mapping of a problem context that can include findings outside the designer's field of competence. A rapid learning process emphasizes self-directed learning. There is a need for more knowledge on how designers could learn from their collaborators to gain project relevant tacit knowledge. The method chosen to address this was case study of a student project. The case study showed how a group of students was collaborating with an external partner, a bank savings foundation, learning rapidly through mind mapping system program. The conclusion of the study was that memes in a creative design process are connected to learning outcomes related to communication and empathy. The identified cognitive qualities of empathy relevant for the design process were multi-functionality, symbolism and brand recognition. The emotional qualities of empathy that were identified were corporate values that might contribute to corporate social responsibility and social interaction. The compassionate qualities of empathy were mutual benefit and positive consequences in society.

*Keywords: Creativity, flow, design collaboration, learning outcomes in product design, e-tool*

### 1 INTRODUCTION: CONCEPTS FROM CONTEXTUAL RESOURCE

According to the psychologist Mihaly Csikszentmihalyi existing knowledge is constituted of traditions called memes; new concepts that has been implemented into society [1]. He claims that the memes accessibility is directly connected to the level of creativity in a society. He proposes that innovation that drive technological advancement happens through evolutionary variation of the existing knowledge. In this perspective knowledge accumulation and knowledge transfer can drive technological innovation forward. According to Nassim Taleb [2] it is too often considered that innovation emerges through a planned process of systematic research and that in reality a new practice emerges from randomness of active tinkering such as creative experiments in the design process [3]. Thus a design competence is to systematically test products through trial and error to contribute to incremental innovation. Similar ideas can be found from Steven Johnson who claims that historical records have overestimated big break through innovators as the key source for innovation; innovation more often happen gradually [4]. Theories of radical innovation tend to isolate the innovator from their context, their habitat, their culture and contextual knowledge streams. Johnson claims that these theories don't recognize the contextual resource availability and co-innovators needed in the process of operationalisation of a creative idea. This study thus aims to explore contextual relevance for emerging concepts in design practice in a complex and technological oriented practice.

#### 1.1 Background: the incubation phase of a creative process

Concept emergence can be identified in the incubation phase of a creative process [5]. Incubation is a process that happens in each individual [6]. In that respect it is a designer's creative role to generate and explore concepts. That presumes that designer has to master design aspects of a given project fast and to learn rapidly about relevant situations [7]. Rapid learning process and adaptive experience are both addressed as part of a complex, systemic design approach. This is relevant in this study because

rapid learning is essential to work as a designer in a technological environment that is increasingly complex [8]. The other important aspect of this research is relevant for design education. In perspective of this article designers need to be enabled to lifelong learning and self-efficacy, through active learning and failure through facilitation of adaptive experiences [9]. The article explores how designers can speed up and systematize this process.

## **1.2 A systemic design approach**

The goal of the systemic design approach is to facilitate mapping of a problem context that can bare findings outside designer's field of competence which allows working in a complex setting [10, 11]. The context is researched through the whole design process but learned at the very beginning in design research. Designers use various process methods to discover these findings from their clients, users and expert informants. It can be enough to collect and map the findings in order to understand a problem context [12]. However it would be ideal if designers could possess clients, users and expert informant's tacit knowledge or memes [1]. That could enable deeper insights and generation of more credible concepts. These insights are collected by designers in a process of 'empathizing' with their subjects.

Nussbaum uses the expression *deep immersion* into a user problem or world [13], described as time devoted only for observing, learning and understanding user perspective. In practice this is the purposely uninterrupted time spent on gathering impressions from the field as well as mapping user environment and activities. This means designers have to experience a user world instead of only understanding it. According to controlled studies in autism by Rogers et.al. [14] there are three types of empathy: cognitive, emotional and compassionate.

Emotional and compassionate empathy are relevant issues in inclusive design approaches that rely on the motto *see user, hear user, be user*. A method to explore the limitations of a product or a system are through such empathy tools [15]. One example is eyewear that limits the eyesight of a wearer so that it's possible to experience the lack of seeing ability while using a product or a system. These tools encourage designers to go towards emotional empathy as they do not only understand but experience the limitations of physically disabled people. In service design [7] the goal is to enable 'Actors' to be involved, engaged and devoted to implementation of new concepts. This encourages designers to search for meaning for the actors, motivating them through the ownership of an idea and the implementation process. In this context designer is not a provider of an idea but a one of the team members that facilitates processes and takes responsibility for the outcome. Designers are encouraged to get personally involved in this process by being neutral and relating to each actor involved equally through compassionate empathy. The research question was how designers could learn from their collaborators to gain project relevant knowledge through empathic collaboration and communication.

## **2 METHOD: CASE STUDY OF DESIGN FOR A BANK FOUNDATION**

The method chosen was case study of a student project for a bank foundation [16, 17]. This approach included participatory observation as a teacher, archival records and interviews. It also relied on literature studies.

### **2.1 Mindmeister mind mapping**

The case study explored how a group of students was collaborating with an external partner using a mind mapping system program called Mindmeister. They mind mapped their research findings and drew connections between them. Collaboration happened both in reality and virtually as users and expert informants were taking part in mind mapping collaboration. Mindmeister is a useful research tool as it stores each version of the document that all collaborators make in a timeline. This makes it possible to see when and what data is stored as well as what is removed from the document revealing design and collaboration process through time.

### **2.2 Analysis of communication: cognitive, emotional and compassionate empathy**

Csikszentmihalyi's memes are not only about to be accessible for everybody but strategically streamed through a flow of knowledge transferred and shared between participants. According to Jones et. al. [18] networked learning is a process of developing and maintaining connections with people and information, and communicating in such a way so as to support one another's learning. Networked learning theory has been revitalized in the last decade because of a major adoption of social media

through communication technologies. One central term in this context is connections and communication through empathy. According to Rogers et al. [14] there are three types of empathy: cognitive, emotional and compassionate. These terms are used in the analysis, to select quotes that give a deeper practical understanding of this topic in an educational context of design, where the aim is to develop theory through case study research [17]. What relevant issues are identified in a student design project in a real life context?

### **3 PROCESS FINDINGS: DIGITAL, MATERIAL AND IMMATERIAL**

In the student project of making a gift product for a bank foundation students were very motivated and adopted the Mindmeister tool easily: *Most of us felt natural to mindmap and found wanting to use it afterwards in other projects*. They described how they were experiencing more control over the project, were accumulating more knowledge and were mastering design aspects in a better way. They have also noticed that it was easier to gather facts without focus on formulation as the mind map would automatically give context to the node. This was stimulating even more data collection in itself: *It was important to throw everything all of us knows out without thinking critically*. Students have claimed that the tool did not demand from them to explain themselves as the other team members could build the meaning on their own from the context of the mind map. In this case, 'Mind- meister' has removed the barrier students had in trying to express themselves creating more empathic environment. Through the project, the design research findings were mind mapped and connections drawn generating new insights. However, students were experiencing difficulties dealing with the complexity of the tool: *We have used Mindmeister mostly for the individual work and common discussions. The common file was very soon clogged and it was not good for sharing files but only overview of the project*. They have also experienced that it was difficult to use mind mapping to communicate with the client, as they established a very formal relationship: *Three of us have used mind mapping to categorize our concepts but that mind mapping was not shared with a client because we wanted to be professional and mind map looked pretty chaotic.* This can imply that students have gained and shared knowledge space through mind mapping that helped the incubation phase of the process. Still, the gained knowledge seemed to have only a slight impact on concept generation. This can be because of lack of substantial knowledge students received from their informants. This can imply that rapid learning takes place on different levels and different points throughout the collaboration. Knowledge Transfer Flow as concept embodied all the learning collaboration points concerning knowledge space exploration [19] for a given project.

#### **3.1 The bank savings foundation**

The project was based on collaboration between 2nd and 3rd year Bachelor students. The 3rd year students should experience to be design leaders and the 2nd year students would experience being design staff in a real design project. Although there were many projects with students who worked with external parties in business, only one was chosen as a case for this study; 12 students that developed a solution for a bank foundation. This was selected as a case study because it exemplified a complex organization where both volunteers and professionals worked together. The learning outcomes generated from the study therefore might be relevant in a variety of settings.

The students began by examining the field to see what of competing products were available on the market. They examined different ways to experience that one has received support from a foundation. They mapped variations of gifts and what the other foundations did. They made a historical study that showed how and why the bank foundation wanted to promote the values of the savings bank tradition and what does it meant in the practice of the foundation. They examined further on traditional banking and bank sponsoring. They examined what it meant to be a sponsor in compared to being a bank, and why the bank foundation often was perceived solely as a bank. They tried to identify the reason for this problem. They made a survey in the field that mapped how the logo was experienced. The survey was followed by in-depth interviews to determine the requirements and needs of the gift recipient.

In this design process, much information was exchanged in both social media and in physical meetings in classrooms. The Mindmeister program was tested and was found helpful by students. The program provided an additional dimension to research that the complex dialogue between the actors was saved. Thus the teacher could also follow the dialogue and how the concepts evolved. It created an openness and transparency in the creative process that might be useful also in a creative process in work life.

This project had a collaborative value when all the subjects were discovering the design topic for the first time and thus collectively identifying their knowledge gaps. Another value was the educational setting where subjects were exploring knowledge and concept space in order to learn how to use them. In addition, the group was sufficiently big that it needed to be split in smaller groups that had to tinker and experiment with parts of the project on their own and communicate their ideas with others.

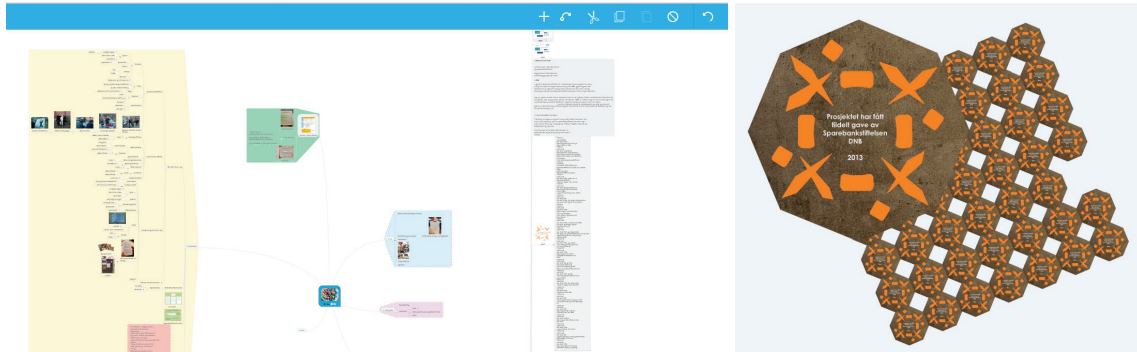


Figure 1. Map of Mindmeister communication that led to a multifaceted gift product concept for the bank savings foundation; a concrete tile with text, flexible stickers and a digital version

The product developed was a multifaceted solution. The concept was a product package with a logo repeated on several elements; on the material gift tiles, on a gift letter and on a waffle iron. The gift had physical, digital, social and symbolic functions where much was about creating mutual empathy between the giver and the receiver, and the community around. The qualitative analysis therefore highlighted three empathic qualities, as recommended by Rogers et al. [14]; these empathic qualities are cognitive, emotional and compassionate.

### 3.1.1 Cognitive empathy in the design process

Examples from the case study shows how the cognitive qualities of empathy were reflected in the project: A big "tile" in a good durable material such as concrete should be placed outside, inside, on the wall, the ground, and almost everywhere. This part of the concept would be most vital for designing gift certificates. A mini chips and label could be placed almost anywhere where you wish. Likewise, a digital network chip developed that could provide recognition effect online media. The cognitive qualities here were *multi-functionality, symbolism and recognition*.

### 3.1.2 Emotional empathy in the design process

Examples from the case study showed how emotional qualities of empathy were reflected in the project: Students were required to reflect the values of the Savings Bank Foundation. A waffle iron with the foundation logo was a fun and different way to show that you have received a gift. It could bring people together. The students' analysis of the logo's blue colour they associated with emotions: *"By looking at the illustration to the right, we see that the colour blue is often associated with banking and finance. Blue is a colour that is seen as loyal, loving, polite, tactful, inspirational, serious and inventive, but also as a snobbish, faithless, suspicious, conservative, lack of confidence and unstable."* The emotional qualities identified were *corporate values, social interaction, and colour associations*.

### 3.1.3 Compassionate empathy in the design process

Examples from the case study showed how compassionate qualities of empathy was reflected in the design project: The students wrote: *"Something we discovered while investigating other funds and foundations was that the bank foundation was especially good at explaining what they stand for and who they are on their website . They could maybe have used these web pages more as a venue to promote and appreciate the gift recipient, to put the receiver in focus?"* In the concrete tile was written within the logo *"We believe in this project. It triggers good forces."* This text was selected according to the students because the foundation gives money to good projects so that it sets in motion a ripple of good forces in society. By having a gift that says in the writing *"It triggers good forces"* several are



included as being the good forces; firstly the foundation by providing money, secondly the forces of the good organization and thirdly all the good forces that comes from the public that will enjoy the gift. The gift receiver comes more into focus. The compassionate qualities here was *mutual benefit, positive consequences in society and faith in the individual's devotion and dedication*.

#### 4 DISCUSSION: MEMES BY DIGITALISED INFORMATION

According to the psychologist Mihaly Csikszentmihalyi existing knowledge is constituted of traditions called memes [1]. By digitizing information we have chance to both adjust memes to be streamed and absorbable. Mapping the research areas, deciding on what and how to research and learning at rapid speed are design skills which are not any less important than framing a problem and exploring concepts. Design practitioners could consider setting up design sessions with the goal to learn from each other and their informants rather than solve design problems directly.

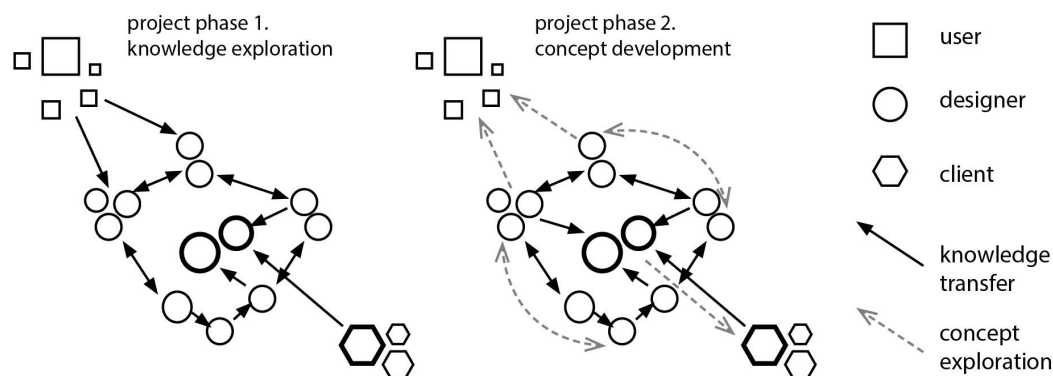


Figure 2. A visualization of a complex knowledge transfer flow

Mind mapping with an e-tool have some good values. The research shows how sharing knowledge exploration space had significance in both learning and generating concepts. Although concept generation can preferably be even more affected by knowledge transfer. Knowledge Transfer Flow as concept represents all the learning collaboration points concerning knowledge space exploration for a given project, as visualized (Figure 2). This flow might be inclined, facilitated and streamlined effectively with new technological and design process tools. A possible implication from the study is that approaches in design education largely can set up design sessions with the goal to learn from each other and their collaborators rather than to solve design problems directly. Further research might reveal how it can be enthused and facilitated with new technological design process tools.

#### 5 CONCLUSION: COMMUNICATION BY E-TOOL

The conclusion of the study was that memes in a creative design process were not only to be accessible but had the potential to be strategically streamed by e-tools to a flow of knowledge. Learning outcomes related to this pedagogical approach includes skills of mapping the research areas, deciding on what and how to research and learning at rapid speed. The qualitative analysis in this study highlighted three empathic qualities related to this concept [14]; these empathic qualities are cognitive, emotional and compassionate. They were relevant in the design process of the study, and they might be relevant learning outcomes for bachelor students in product design. Such learning outcomes was in this study promoted by a practice oriented project, with many collaborators in a complex context. In this study, the process was supported by an e-tool that enhanced the learning process between many participants. It also documented the learning process in a transparent way.

##### 5.1 Learning outcomes: Empathic qualities in complex design processes

The identified cognitive qualities of empathy relevant for the design process were multi-functionality, symbolism and brand recognition. The emotional qualities of empathy that were identified were corporate values that might contribute to corporate social responsibility, as well as, social interaction and colour associations. The compassionate qualities of empathy in this study were mutual benefit, positive consequences in society and faith in the individual's devotion and dedication. The approach thus contributed to a complexity that stimulated flow and creativity.

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