Women in Makerspaces

- A Study on Women Participation in Makerspaces

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We would like to give a big thanks to Trekanten and MakerSpace 9220 for the collaboration for this thesis.

AALBORG UNIVERSITET

MAKER SPACE 9220

TREKANTEN
Vi skaber sammen

Abstract

This thesis explores the dynamics of gender inclusivity in Makerspaces and DIY Communities, with a focus on MakerSpace 9220 within Trekanten, Bibliotek og Kulturhus. The purpose is to address the underrepresentation of women in makerspaces. Using phenomenological and hermeneutic approaches and employing action research, the study identifies key themes related to women's participation and experiences in makerspaces and within the STEM fields. We examine various factors influencing women's experiences in these spaces, considering theoretical concepts within and outside our field of study, Experience Design, such as experience, atmosphere, norms, scripts, motivation, and self-efficacy, drawing on theoretical frameworks from Jantzen, Dewey and Bandura, among others.

The research methodology involved the utilisation of Hird & Kvistgaard's Experience Matrices, Pine & Gilmore's THEME analysis, observations, a semi-structured focus group interview, and questionnaires. Key concepts are defined for clarity and cohesion of the thesis.

Our study involved direct experience matrix analyses of MakerSpace 9220 and Art By Me, to experience and extract principles. We facilitated a multi-part workshop at MakerSpace 9220 with five participants. Background data on these five women were collected, and observations were conducted during the workshop activities, followed by a focus group interview. We reached out to the current makerspace users with an online questionnaire, and an affinity diagram analysis was used to organise and identify common themes from all collected data.

Discussion of the findings revealed the crucial role of a facilitator in creating inclusive communities. The importance of visibility for women in these spaces to reflect themselves in and as physical visibility of the space itself and the overall need for gender

inclusivity were also prominent findings. Further, an iterative design approach was taken to refine the problem statement and develop potential solutions.

The thesis concludes with five proposals for improving gender inclusivity, self-efficacy and increasing the number of women using MakerSpace 9220, based on the results of ideations and a thorough discussion of the potential solutions. The implications of this research and proposals for future works are also discussed, highlighting the significance and impact of this study on enhancing female participation in STEM-oriented maker-spaces and DIY Communities.

Keywords: Experience, IT, Social Inclusion, Experience Design, Self-efficacy, STEM, Makerspace, women, Gender Inclusivity

Special Thanks.

Special thanks to our supervisor, Elizabeth Jochum, for guiding and helping us with this thesis, as well as to Trekanten, Bibliotek og Kulturhus, and MakerSpace 9220 for their great partnership. Lastly, we would like to express our heartfelt appreciation to our friends and family for their help and support.

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1. Introduction

1. Introduction

"You are taken by hand and then pushed out of the nest in an 'empowering' way, and you feel that you have the skills to master it all" - this poignant metaphor, shared by one of our workshop participants, beautifully encapsulates the essence of our study.

Learning to fly is a challenging and critical rite of passage for every bird; it marks the transition from a hatchling reliant on caretakers to an independent adult. Similarly, navigating the path of self-efficacy and empowerment can be daunting for individuals. The flight from the nest can often be met with societal doubts, as expressed by another participant: "It's not because women can't, or don't want to, or think they can't. It's because there are some others who think they can't." Our society readily accepts that the fledgling bird will learn to fly, but do we extend the same faith to women? Moreover, when we push them from the metaphorical nest, do we provide them with the tools they need to confidently navigate their flight?

In this research, we employ this striking bird metaphor as a framework for our exploration, where we, through our study, seek to empower women in makerspaces and design proposals or tools to bolster their confidence, thereby fostering success in their creative pursuits. Our goal is to enable women, these 'birds', to spread their wings, overcome societal biases, and conquer the world with their skills and talents. Through our efforts, we hope to contribute to making the world more inclusive for women, one makerspace at a time.

Given the magnitude of the challenge, it is clear that we cannot change everything at once. Thus, our focus narrows down to an area of compelling interest; the maker move-

ment. This vibrant community professes a commitment to inclusivity, yet, paradoxically, it remains predominantly occupied by white cis-gendered men. Why does such a contradiction exist? In this thesis, we delve into this conundrum and explore the apparent shortage of women in makerspaces. For instance, women account for a mere 24% of users in FabLabs, a community closely related to makerspaces, as outlined in Section 2.2.2 Women in Makerspaces and DIY Communities. This disparity spurred our curiosity and provoked us to dig deeper into this issue.

Recently, there has been promising development: the Villum Foundation allocated 43.3 million DKK to eight municipalities in Denmark in 2022, funds explicitly earmarked for developing new makerspaces and training teachers to educate in these settings; however, only within educational institutions for younger students (Pedersen, 2022). This investment signifies an opportunity for future generations of our metaphorical 'birds' to become acquainted with makerspaces and their inspiring communities from an early age, empowering them to fly high within these spaces.

In our field of study, Experience Design, we are outfitted with methods, tools and theories to initiate change, specifically by including technology in physical frames of experiences. We intend to put these resources to use in our thesis. As we delve deeper into our problem area, we explain our choice to collaborate with one specific makerspace in Aalborg, MakerSpace 9220 (For a detailed description, refer to Section 1.1 Trekanten, Bibliotek og Kulturhus). During a workshop we conducted at the makerspace, one participant vividly shared, "[MakerSpace 9220] is fantastic, there are many opportunities where you can unfold your skills – tools are not an obstacle but an opportunity. There is room for everyone." Despite such an enthusiastic endorsement, it puzzled us why a gender gap persists in this seemingly inclusive space. Thus, our goal is to seek answers to the following critical questions: Why does this disparity persist when makerspaces are perceived as fantastic and inclusive? What underlies this uneven gender distribution? And,

importantly, what can we do to address it? We invite you to join us in this exploration as we will unravel the complexities surrounding women in makerspaces in this thesis.

For the sake of clarity, we point out that our thesis is structured into eight distinct chapters: **1.** Introduction, **2.** Literature Review and Theory, **3.** Definition of terms, **4.** Methodology, **5.** Our Study, **6.** Discussion, **7.** Proposal, and **8.** Conclusion. Each of these chapters includes sections and subsections, as detailed in Figure 1. As you, dear reader, delve into the pages that follow, we hope to shed light on these pertinent questions and to chart a path towards a more inclusive future.

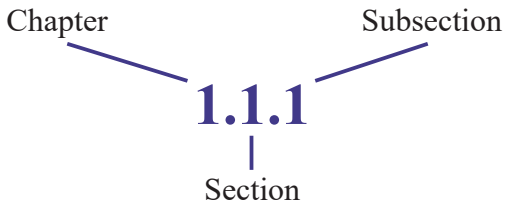


Figure 1 Our Structure (own picture).

1.1 Trekanten, Bibliotek og Kulturhus

This section briefly describes Trekanten, Bibliotek og Kulturhus, a cultural centre in Aalborg East. In our study, we specifically collaborated with MakerSpace 9220, which is a subdivision of Trekanten. First, we describe Trekanten's objectives and aspirations, the initiatives and services the facility offers, how this place is important for cultural activation, and then we give a historical overview of changes to the community centre since its founding. Lastly, we briefly describe MakerSpace 9220, its origin in the maker movement (See Section 2.2.2 Women in Makerspaces and DIY Communities), and its situation within Trekanten as a municipal-run community centre.

Trekanten, located within the eastern part of Aalborg Municipality, is a library and cultural centre. Its mission is grounded in three pillars: knowledge, technology, and culture. Its

developmental objectives focus on expanding visitor engagement, fostering integrative activities, introducing children's cultural programmes, and enhancing its reputation as a cultural hub within the Alborg East region. All events and initiatives that Trekanten undertakes include one or more of these pillars (Sonn, 2012).

Trekanten provides a wide range of services and hosts diverse activities that cater to the needs of its local community, functioning as a meeting place and a cultural and educational hub. It plays a vital role in promoting a sense of community and belonging, fostering personal development and well-being, as well as providing access to essential resources and information through its library section, makerspace and events (Sonn, 2012).

With the diverse demographics of Aalborg East, Trekanten is instrumental in improving the community members' quality of life through various services, job training, and employment assistance through volunteering in partnership with different organisations such as 'Kvarterværkstedet' and 'Grønlandske Børn'. Its team is committed to inclusivity and diversity, providing a welcoming space for individuals from all cultural backgrounds (Sonn, 2012).

Community and making are central to Trekanten's ethos and serve as a potent tool for social integration and change, which shows in their slogan "Vi skaber sammen", roughly translated to "We create together". It enables shared experiences, promotes mutual understanding, and gives a platform to marginalised communities. Trekanten offers a safe space for self-expression, cultural appreciation, education, entertainment, and social support. It aims to provide a unique platform for diverse groups in Aalborg East to share their experiences, fostering cultural understanding, respect, and tolerance. This is important as Aalborg East has the highest population of inhabitants from a diverse ethnical background of about 29% and a large vulnerable population (Sonn, 2012).

Originally, Trekanten was founded in 1984 as a family and activity centre and has transformed from its early days as a meeting venue into the vibrant cultural hub it is today. Following a leadership change in 1997, it came under Aalborg Municipality's 'Skole- og Kulturforvaltningen' (School and Culture Administration). It was further reshaped by the relocation of a local branch of Aalborg Bibliotekerne (Aalborg Libraries) into its premises in 2006 and the integration into the municipality's 'Kultur- og Fritidsafdelingen' (Culture and Leisure Department) in 2010. Funded by both public and private sources, Trekanten demonstrates a typical financial structure of community centres (Sonn, 2012).

Trekanten continued to innovate by establishing a makerspace based on the maker movement in 2018 called MakerSpace 9220 in the cellar of the facility (J. Christensen, personal communication, 2022). The maker movement is a cultural phenomenon characterised by the active engagement of individuals, commonly termed 'makers' in producing physical objects, frequently through digital production technologies. This movement is commonly related to the do-it-yourself (DIY) ethos, as makers often opt for the autonomy of personal creation over the convenience of store-bought products (Geser et al., 2019).

Makerspaces are tangible facilities that house this movement and are frequently located within libraries, schools, and community centres. They function as collaborative environments where participants can pool resources and undertake individual and cooperative projects. These spaces are typically equipped with tools and machines, encompassing 3D printers, laser cutters, electronic prototyping tools and manual tools, offering individuals the necessary resources to actualise their creative endeavours (Geser et al., 2019).

The maker movement is frequently perceived as a conduit for promoting creativity, innovation, and experiential learning, providing individuals with opportunities to improve their skills and knowledge through active project engagement and collaboration. Moreo-

ver, this movement is seen as a catalyst for encouraging entrepreneurship and economic development, as makers often commercialise their creations into viable businesses or marketable products (Geser et al., 2019).

However, MakerSpace 9220 is not entrepreneurial in the sense that individuals utilising the space are not allowed to use the machines for mass production of their creations for economic gain, as access to materials comes with low prices and is market matched to ensure anyone can afford it. This entrepreneurial hindering is because MakerSpace 9220 is part of Trekanten, a non-profit governmental institution, and is a separately run unit, yet still a subsidiary of Trekanten (J. Christensen, personal communication, 2022).

Makerspaces can generally be seen as a form of social intervention because they provide opportunities for people to come together to support, learn and create, which might foster a sense of community. MakerSpace 9220, in a similar fashion, provides access to tools and equipment such as laser cutters, 3D printers, sewing and embroidery machines, large-scale printers and folio cutters, to mention a few. These machines are costly and sometimes hard to attain; however, this public makerspace has made them available to regular people who do not need a membership or affiliations, as is usual with university or business-oriented makerspaces. All the machines are resources for people to create, invent, and learn with, both by themselves and in collaboration. It is a hub for people to socialise, explore common interests and passions, and develop new skills and knowledge. In other words, MakerSpace 9220 aims to provide a safe and welcoming space for people to create, seek out help and find support and encouragement from others (J. Christensen, personal communication, 2022; MakerSpace 9220 | En del af Trekanten, n.d.).

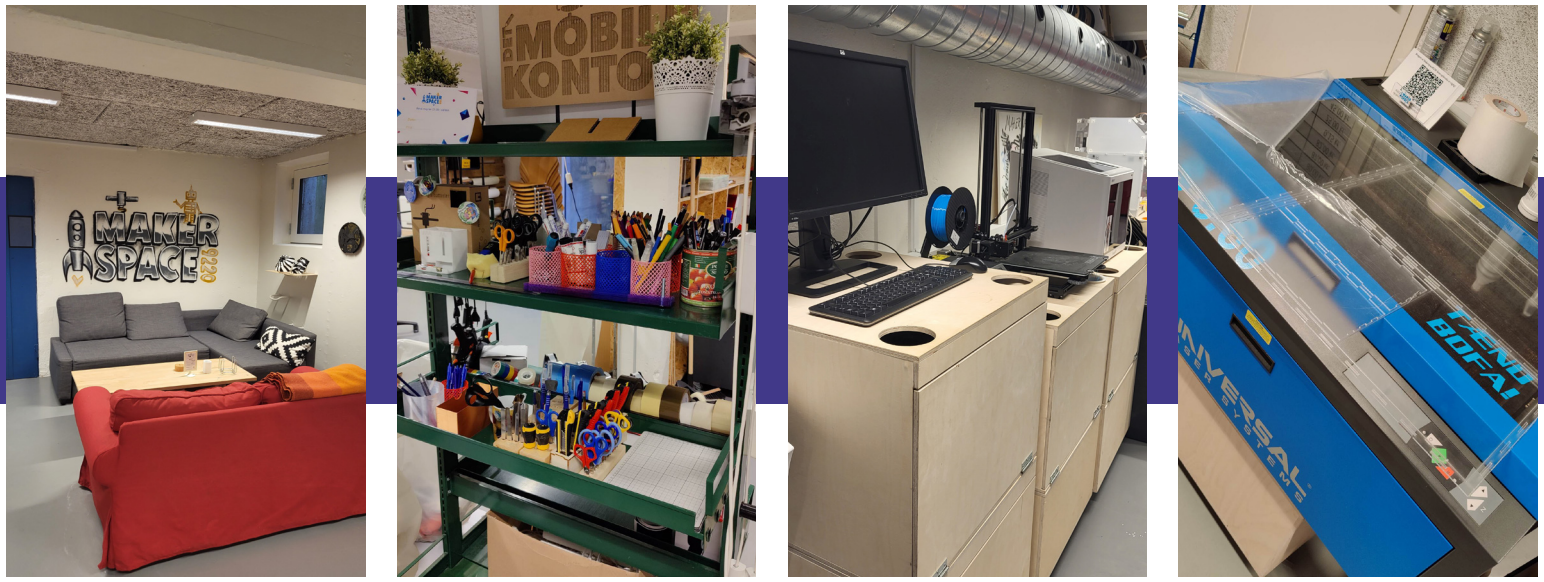


Figure 2 Picture collage of MakerSpace 9220 (Own pictures)

MakerSpace 9220 is open for all citizens above the age of fifteen on Mondays and Wednesdays between four and nine in the evening (MakerSpace 9220 | En del af Trekanten, n.d.). It is one large room in the cellar of Trekanten with a sofa corner, stackable pillow seats and worktables in the middle (See Figure 2). The machines are situated towards the walls around the room with a shelf or two to showcase projects and designs of what the machines and users have created (See Appendix A for more pictures of the facilities). The number of visitors using the facilities varies, with as few as one or two up to about thirty on a hectic day (See Appendix B). Based on observations and statistics from Trekanten's archive, the number of visitors seems irregular but increases as seasonal events, such as Christmas, Easter and confirmations, occur (See Appendix B).

Based on these statistics and our particular problem field, explained in the next section, we shortly define our intended target group here. For the product outcome of this thesis, we were interested in recruiting women for a workshop we knew should be held at MakerSpace 9220. We decided to recruit women that work within IT. This choice is also practical in nature, as our workshop is short and we do not have time for possibly having to educate the participants on basic use of computers. We wanted a certain familiarity

and competency with digital tools in our participants, and to make sure we did not accidentally invite women without these competencies, we made it a requirement for them to be positioned within an IT field. This is not to say that women outside of IT fields are digitally illiterate, but by choosing this segment, we could ensure the participant had a certain degree of competency with digital tools because we perceive digital literacy as an advantage for gaining data for this thesis. This limit also ensures that the participants have more time to engage with the machines in the makerspace actively.

Another reason for choosing women in IT is because they, based on STEM statistics (See Section 2.2.1 Women in STEM), might study or work in male-dominated fields, similar to makerspace environments. Therefore, we posit that women within IT might relate to women in makerspaces and can contribute with their personal felt experiences and opinions of being minorities within these fields.

As explained above, MakerSpace 9220 is a fascinating place with many opportunities for people visiting Trekanten. However, one point of contrition that a group member noticed during her internship was a passively observed shortage of gender diversity within the space, more precisely, an uneven number of women users and users of various ethnicities. This made us wonder what underlying problems might be the reasons for the lack of women in MakerSpace 9220.

1.2 Problem Area

The problem area we have chosen to research is women in makerspaces, and our motivation for choosing this subject is rooted in our personal interest and a first-hand experience with MakerSpace 9220. As mentioned above, one of our team members underwent a three-month internship in the makerspace, where she observed a general lack of women as regular visitors. This observation led us to research makerspaces in general and women's involvement in STEM fields, as they are connected entities.

We chose to focus our study on women and not ethnic diversity, to limit our study and because our work within the IT field does not reflect this gender disparity, so why does this lack of women exist in a creative space so closely related to our field. Based on personal experiences attending creative fairs, markets and conferences, women are usually the majority in these fields. In our opinion, makerspaces and similar technology-supported creative spaces should reflect this norm; however, it does not. This observation is one reason for our interest in women in makerspaces; it is close to our hearts as creative women working within the IT field. Therefore, we have a personal stake in trying to increase the number of women in makerspaces.

What makes MakerSpace 9220 different from makerspaces in educational institutions is the open access to the public and affordability. Anyone can use the machines and facilities, regardless of their technological or creative skillsets or economic status.

1.2.1 Project Goals

Our initial goal was to analyse and redecorate the interior space, making it more inviting for participants, especially women. The lasting impact should be greater awareness of MakerSpace 9220's existence in Trekanten and, thereby, a greater and more regular number of visitors and users of the space, which aligns with Trekanten's goals.

We intended to achieve our prior goal through an intervention over a period of time at MakerSpace 9220. Additionally, we had a subgoal to develop principles based on this intervention, resulting in a transferable inclusivity design guideline, which other makerspaces could utilise and assimilate into their own, leading to our initial problem statement:

How can theories and models from Experience Design be applied to transform the overall experience of MakerSpace 9220 to create an inclusive atmosphere that is welcoming to women while still maintaining the current members' community?

Subquestion: Can we encourage more women to become part of Maker-Space 9220, and is there an observable change after our intervention? (Maybe measured over 2-3 months?)

Further into our study and after our analysis phase, we discovered that the interior of MakerSpace 9220 had less impact on the participants and users than we hypothesised. We found other, more essential, topics of interest to look into with this dissertation. These included topics such as visibility of MakerSpace 9220 in various ways, the importance of self-efficacy and empowerment, the connection between these and users' comfort (we re-define the word comfort in Chapter 3. Definition of Terms) with using the machines, the importance of community, inclusivity and social aspects of participating, and the role of the facilitator on all of the above. These findings culminated in a new problem statement, presented in Section 1.2.3 Problem Statement.

1.2.2 Thesis Impact

Throughout this reflective journey, our subject of inquiry has changed in various ways, as explained above. However, the overarching impact we intended to depart with has not changed; it has simply expanded to include topics that were previously unknown to us.

With this study, we intend to contribute to the larger academic discourse in the hopes of departing new or more nuanced knowledge to the field of gender inclusivity in maker-spaces. Since makerspaces are closely related to STEM, we hope to indirectly affect the number of women in these fields and widen the horizon by pointing out that STEM is for everyone and not only men. In general, we feel that one should not judge a person's

choice of education, preoccupation or livelihood based on gender, as happens unintentionally in society. Everyone should have access to the same opportunities, and socially constructed views of gender roles should not be a hindrance.

Based on the outcomes of our study, we feel that for environments, i.e. STEM fields, universities and makerspaces, to become more inclusive and diverse, a change in the general environment needs to happen (See Section 2.2 Women in STEM for insight into this topic).

1.2.3 Problem Statement

The reformed goals, our intended impact, analysis, and reflection through the process of our study led to a narrowing of our problem area summarised into the following problem statement:

How can we, with theories, methods and models from Experience Design, design interventions for Makerspace 9220 that advocate for inclusivity, so that women feel empowered and confident with the machines, thereby creating a larger and more diverse community of fellow co-learners?

1.3 Thesis Approach

In the following sections, we first introduce the lens or philosophy of science we adhere to throughout this dissertation. We have chosen a combination of Phenomenology and Hermeneutics as the perspective through which we aim to explore all literature, data, reflective discussions and the deliverable of this project, which contain future proposals for MakerSpace 9220. We mainly build our approach on the chapter "Fænomenologi" by Jacobsen et al. (2015) from the book *Kvalitative Metoder* by Brinkmann & Tanggaard (2015) and on the article "Phenomenology and Hermeneutics" by Rosfort (2019).

After that, we introduce the research approach in this thesis, Action Research, as our primary process for constructing, planning, executing and evaluating our research, before continuing to the next chapter, 2. Literature Review and Theory.

By pointing out the underlying lens, the overall approach t, and clearly describing the Problem Area, we intend to be transparent and help guide the reader through our processes, intentions, choices and findings made during this research.

1.3.1 Phenomenology and Hermeneutics

Hermeneutics and phenomenology are two distinct yet connected philosophical traditions which offer unique perspectives on human experience. While hermeneutics has ancient roots, phenomenology was credited to Husserl in the early 20th century. The two approaches differ in their focus: phenomenology strives to depict and comprehend pre-reflective experiences, essentially experiences before they are consciously analysed, while hermeneutics seeks to articulate the reflective facet of human experience as it presents itself in language and other forms of creative expression (Rosfort, 2019, p. 1). Despite these differences, hermeneutics and phenomenology share overarching philosophical goals and themes, acting as mutual complements to enrich our understanding and interpretation of human experiences (Rosfort, 2019).

The most important tenet of phenomenology, according to Jacobsen et al. (2015), is that the researcher approaches the world and the unknown with an open mind and actively leaves categorisation aside:

> According to phenomenology, we should never take it for granted that one knows what another person feels, thinks or wants, even when it comes to our spouse or our child. We need to ask and listen carefully, which means we should set the assumptions, theories and reflections we usually have on the subject aside for a while (own translation, Jacobsen et al., 2015, p. 282)

Phenomenology tries to impart that one should approach and describe phenomena as they are without the ingrained ideas, stereotypes, and assumptions that researchers have been taught. To describe the phenomenon as it is and not fall into the trap of overlooking what is right in front of us.

As humans, we always experience and think; when we do so, we do it towards something. Thus, we are never separated from the thing we sense or perceive as we reach towards it, and the world is there to reach towards us. Thus, we are not separate objects but coherent units. Intentionality dissolves the separation between a person and the world, and through intentionality, we access descriptions of phenomena that have importance for our consciousness (Jacobsen et al., 2015, p. 284).

On the other hand, hermeneutics provides a lens to interpret all forms of human activity and views humans as self-interpreting, meaning-creating beings in search of identity. This philosophy underscores the ongoing interpretation of our world, striving for collective understanding. In essence, every action and statement is interpretative, as we subconsciously decode our surroundings based on pre-existing knowledge (Rosfort, 2019).

As mentioned, human beings are self-interpreting. We are interested in that which we experience, and with experience comes a need to articulate our experience (Charles Taylor in Rosfort, 2019). Phenomenology focuses on the subjective experience of the individual, while hermeneutics emphasises the importance of interpretation and understanding. Thus, in tasks involving interpretation of experiences or exploration of experiential spaces, a hermeneutic approach is especially relevant (Hird & Kvistgaard, 2010). As Rosfort (2019) states:

> To interpret the *what* and the *why* of our experience, however, we need to pay careful attention to *how* we experience that which we experience. This interplay of the interpretative and experiential aspects of human experience is at the core of the relationship of phenomenology and hermeneutics (p.3).

In the process of designing and analysing human experiences, it is crucial to consider how these experiences are perceived by the intended experiencers. Phenomenology, focused on the examination of phenomena, provides a framework for understanding how particular phenomena are subjectively experienced. Rather than detailing unique experiences, phenomenology offers methodological tools to articulate and comprehend the foundational structures and dynamics of experiences that inform human subjectivity (Rosfort, 2019, p. 3). These tools allow an in-depth exploration of the human condition, capturing the specifics of how we experience time, space, our bodies, ourselves, and others. These facets of phenomenology can serve as guiding principles for understanding humans in relation to their experiences within particular case studies, such as this research.

Hermeneutics can then help to interpret and understand these experiences in a broader context. This involves analysing the cultural, social, and historical factors that shape how visitors interpret and understand the experience. Understanding the various interpretive frameworks that visitors bring with them makes it possible to gain a deeper understand-

ing of the meaning and significance of the experience, which ultimately helps us understand and interpret the human factor within the data we collected during this study. By combining phenomenology, hermeneutics, and later Hird and Kvistgaard's (2010) Experience Matrices as a methodological tool for data gathering, evaluation and analysis of our research, it is possible to gain a deeper and more nuanced understanding of the experience room, i.e. MakerSpace 9220, our research is based on and to identify ways to enhance experiences for future visitors (See Chapter 4. Methodology for insights into the use of phenomenology and hermeneutics in this thesis). The tenets of hermeneutics are very similar to our research approach, action research, which we outline in the following section.

1.3.2 Action Research

We used principles of action research as a process model. Action research is concerned with both practical and theoretical dimensions of research and merges theory with practice, focusing on including participants as active voices. This process model can be divided into an iterative, cyclical, four-step process and can be understood as a self-reflective spiral with four steps, similar to the hermeneutic spiral, where one gains new insights that can redefine the research question, which again can lead to new research and insights. This means one can go through the four steps multiple times during a given project. Action researchers decrease the barrier between the researcher and the participants by actively participating in the situation while doing the research (Coghlan, 2019; Dick et al., 2009; Kidd & Kral, 2005).

According to Nielsen & Nielsen (2015), action research originated in England and the USA after the 2nd World War as a humanities and social sciences research practice when German-American psychologist Kurt Lewin stated that the dominating research paradigm was too abstract and 'academic'. Lewin stated that contemporary research could not produce relevant knowledge to solve the pressing social tensions and contradictions in American society (Nielsen & Nielsen, 2015).

Kidd and Kral (2005) describe action research as a dynamic process where researchers and participants develop goals and methods. Both researchers and participants participate in the gathering and analysing of the data. They further describe participatory action research as a self-reflective spiral with multiple sequences of reflecting, planning, acting and observing. Coghlan (2019) agrees but describes action research with a pre-step, context and purpose, in addition to the four iterative and cyclical steps: constructing, planning action, taking action, and evaluation action (See Figure XX below). Before the four steps, Coghlan's (2019) pre-step starts by asking contextual questions; why is this project necessary or desirable? External contextual questions; what economic, political and social forces drive change? We attempted to answer aspects of these questions when we defined our problem field (See Section 1.2 Problem Area).

Furthermore, looking at the internal forces, what are the cultural and structural changes? When the need or desirability of the project is identified, one must define a desired future state. In the preliminary phase, the project's context and purpose must be clear and defined (Coghlan, 2019, p. 9).

Our initial problem statement (See Section 1.2 Problem Area) was our first attempt at defining the context and purpose of this thesis, and the focus was on machinery and software instead of the human factor. This focus was revised with all group members based on our shared, limited information and our expectations of how we thought we should align our research with Trekanten and MakerSpace 9220's perspectives. We also based this problem formulation on our initial literature research. This process constitutes our preliminary action research phase, including our observed lack of women in this specific makerspace, where we believed that a change of perspective on the space could be one part of a solution.

After the preliminary phase, the action research cycle begins with the first step, constructing, a dialogical activity where stakeholders identify possible issues with the re-

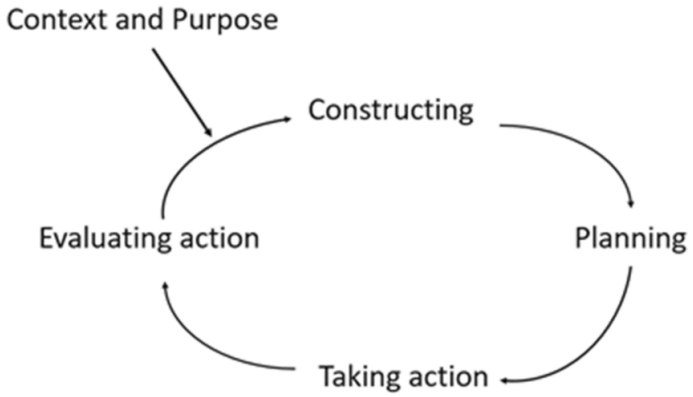


Figure 3 The action research cycle (Coghlan, 2019, p. 9)

searchers. In this step, one must also articulate the practical and theoretical foundations of actions. The second step consists of planning action. In this step, one plans the action and explores the context and purpose of the project. In the third step, taking action, one's plan from the previous steps is implemented, and interventions start. In the last step, evaluating action, one examines the actions' outcomes. In this examination, it is important to remember both the intended and unintended outcomes (Coghlan, 2019, pp. 10–11).

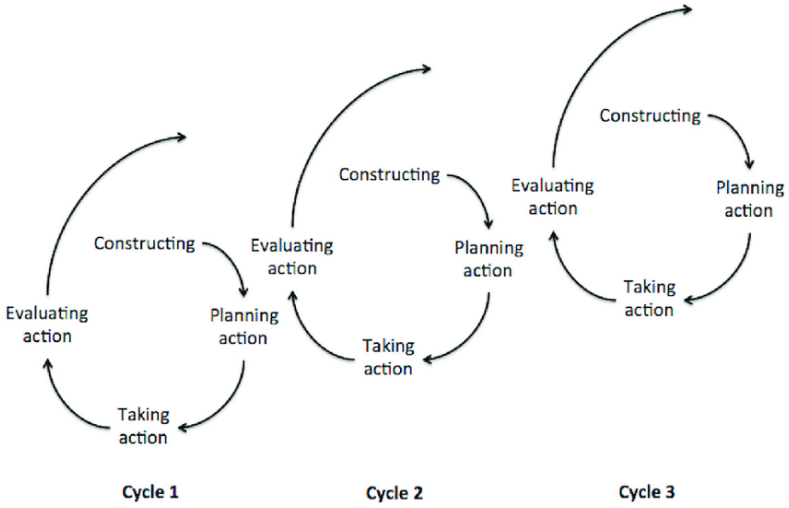


Figure 4 Cycles of action research (Coghlan, 2019, p. 11)

When doing action research, having multiple cycles operating simultaneously, though with varying timespans, is common. One cycle might be the whole project which takes months, whereas other cycles might take smaller timespans, e.g. creating and executing one workshop at MakerSpace 9220, which takes days to plan, hours to execute and days to examine and analyse (Coghlan, 2019 p. 11).

The larger cycle in our project consists of a pre-phase, where we established cooperation with the manager of MakerSpace 9220 and the manager of Trekanten (See Figure XX). In the construction phase, the overall action was a literature review. We examined other studies to gain insights into other researchers' works on this subject and how they conducted their studies. We also examined the principles and practices used in their studies to extract valuable knowledge for our thesis. In addition to the literature review, we read and selected theories to build the foundation of our study. In the planning action phase, we planned a workshop and adhering activities, made an observation sheet, and planned an analysis of MakerSpace 9220 as an experience room to gain insights into MakerSpace 9220 from our point of view. We prepared to question current users in an online survey and interview potential users of MakerSpace 9220 for their points of view. Our taking action phase comprises all of the above; however, set into action (See Chapter 5. Our Study). The last phase, evaluating action, included analysing all data we gathered during the previous phases with an affinity diagram analysis, which we executed in a collaborative online platform called Miro (n.d.) (See Appendix C for a visual of this process). This evaluating action phase provided new insights into our problem area and led to a new constructing phase, where we reiterated our problem statement and planned for an idea generation process in the new planning action phase. This planning led to taking action where we generated ideas, culminating in five concepts to develop further on as possible solutions for MakerSpace 9220 (See Chapter 7. Proposal).

Within the larger cycle, we worked on additional subcycles, where we analysed Art By Me (Om Os | Art by Me, 2023), a café that offers a creative outlet for painting ceramics, as an experience room. We chose this place because this venue is viewed as a creative and feminine space even though the founders promote themselves as a place for diverse visitors. MakerSpace 9220 also promotes itself as a place for diverse users, but in contrast, it is viewed as a masculine space (See Section 5.1.2 Art By Me for a more profound reasoning behind this choice).

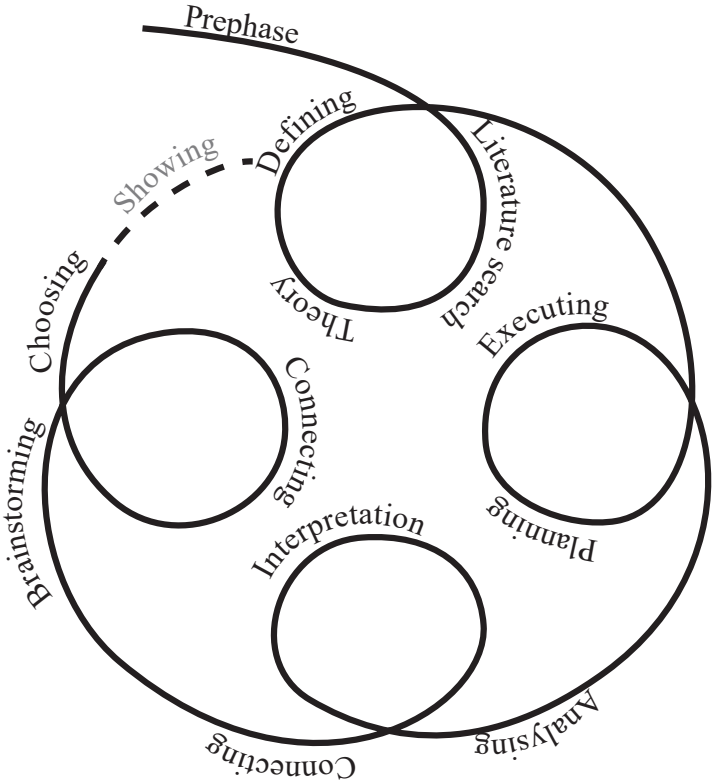
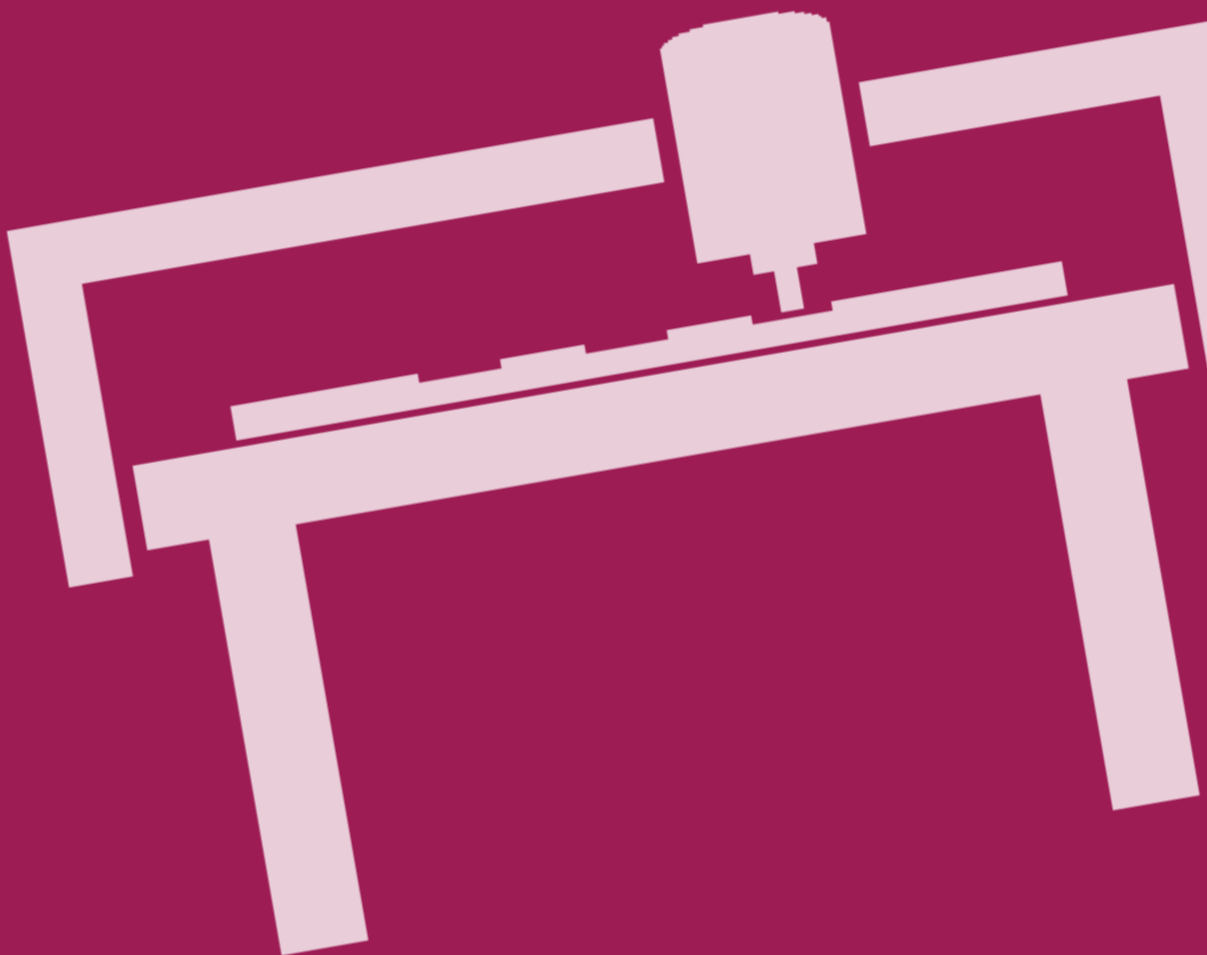


Figure 5 Simplified illustration of process (Own Picture)

The workshop we conducted at Trekanten was a result of our primary cycle, as well as a cycle by itself. We planned which methods would be most suitable to use, an appropriate activity for the participants, the location for the workshop, and which group member was responsible for which part of the execution. After that, we conducted the workshop with our participants and evaluated the workshop, the outcomes, and the new insights we gained into our problem area (See Section 5.2 Workshop for a more concise description). Throughout the workshop, we established a relationship with our participants, so they would feel comfortable and safe to share their experiences and opinions on our problem area, as we concluded the workshop by conducting a semi-structured focus group interview. The relationship between the researchers and the members is paramount for creating a safe and open space for sharing ideas (Coghlan, 2019).

From this introductory overview of our thesis, where problem statement, context and research approach were presented, the next chapter put into focus our theory and literature review.

2. Literature Review and Theory



2. Literature Review and Theory

This chapter unfolds our rigorous exploration of various literature sources and the theoretical foundations that are the cornerstones of our research. It meticulously intertwines our literature search strategies with a systematic review of relevant works while underpinning our study with relevant theoretical concepts and is separated into three main sections.

Section 2.1 Search and Identification of Literature, encapsulates the search for relevant literature and was launched with the utilisation of Google Scholar and Primo search databases. These databases offered us a vast array of scientific and scholarly resources. However, to drill deeper into the field and unearth literature with a more direct bearing on our study, we turned to Connected Papers (n.d.). This platform helped us visualise a scholarly landscape, bringing to light interconnected research papers that were instrumental in shaping our understanding.

Section 2.2 Literature Review, is our literature review process, which began with a keen examination of the scholarly text "Rekruttering og fastholdelse af kvinder inden for STEM : Indsatser og erfaringer på universiteterne" by Faber et al. (2020), which cast light on the challenges and experiences of women in the STEM field. The insights gleaned from this review set the stage for our study on women's engagement in creative spaces. Our inquiry then narrowed down to focus on women in Makerspaces, where we, as explained in Section 2.1, identified and reviewed five seminal articles that addressed this context. The perspectives gathered from these articles have played an instrumental role in shaping our understanding of the complex dynamics at play in the Makerspaces.

Section 2.3 Theory explores theoretical concepts that provide the lens through which we interpret our findings. These concepts include experience, atmosphere, cognition, emotion, motivation, scripts, and self-efficacy, which individually provide models of under-

standing and, collectively, give us a nuanced picture of the whole. Each of these concepts forms an essential component of our theoretical framework and informs our interpretation and understanding of the phenomena under investigation.

The forthcoming sections delve into the specifics of these reviews and theoretical concepts, underpinning our research with robust academic grounding and nuanced understanding. Furthermore, we elaborate on how these pieces of literature and theoretical frameworks have been utilised in our research. Ridley's insight (2012, p. 6) encapsulates the spirit of our approach: "your research is a small piece in a complicated jigsaw puzzle; it does not exist in isolation. It is dependent on what others have done before, and you will contribute to an ongoing story or debate." Therefore, through this chapter, we strive to position our research within this ongoing narrative, offering a rich background to facilitate a comprehensive understanding of our topic.

2.1 Search and Identification of Literature

Early in our research, we made a general search on Google Scholar using the search words 'woman/women' and 'makerspace'. Looking through the articles presented and their abstract, we identified four relevant articles. These articles were "Sprinkling Diversity: Hurdles on the Way to Inclusiveness in Makerspaces" by Smit & Fuchsberger (2020), "Guiding Principles for Designing an Accessible, Inclusive, and Diverse Library Makerspace" by Yi & Baumann (2018), "Making Change: Can Ethnographic Research about Women Makers Change the Future of Computing?" by Faulkner and Mcclard (2014) and "An exploration of women's engagement in Makerspaces" by Bean, Farmer and Kerr (2015).

We attempted a similar search in Danish on Primo, Aalborg University's search engine, with the keywords 'kvinde*' OR 'pige*' AND 'STEM'. This search gave about 50.000 results, where most involved cellular biology. Excluding 'pige*' in the search gave a result of 1.029, and exchanging 'STEM' for 'Makerspace*' gave a result of 3.822. Most

results were irrelevant; however, a few books seemed reasonable and especially one article seemed very relevant. This article was: “Rekruttering og fastholdelse af kvinder inden for STEM: Indsatser og erfaringer på universiteterne” by Faber et al. (2020). This literature review gave us a reasonable basis for understanding the lack of women within STEM fields in higher education.

After reading through all five articles, we identified Smit & Fuchsberger’s article as the closest to our intended problem area. Therefore, we took “Sprinkling Diversity” and submitted it to Connected Papers. Connected Papers (n.d.) is a different kind of search database that does, amongst others, a cited and reference list check based on a central chosen text and then displays the result with a clustered neighbourhood node graph linking the relevant texts (See Figure XX for the result of the Smit & Fuchsberger (2020) article), and is helpful for quickly gaining an overview of a larger scope of connected texts. The colouring of the nodes in the graph shows if the connected works are older or newer than the core text.

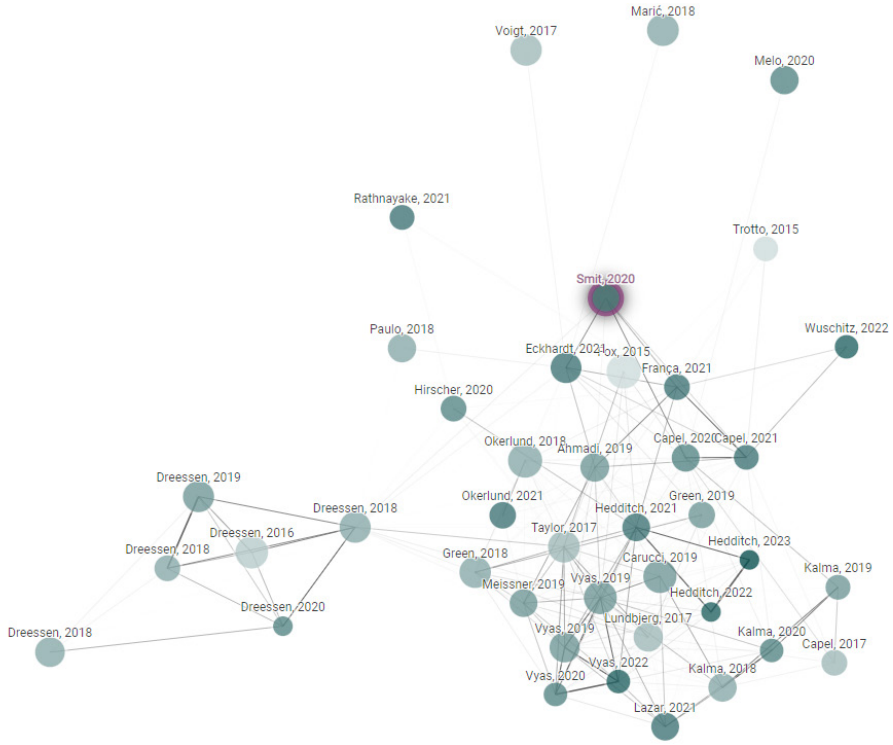


Figure 6 30 Displaying over nodes connected to our central literature search (Connected Papers | Find and Explore Academic Papers, n.d.)

This search resulted in twenty texts, ten prior and ten derivative works. We read through these and made an annotated bibliography with a summary and evaluation of each work. It provided a quick overview of the sources, their context and specific topics. We identified the content and purpose of the source and tried to identify the author's qualifications, their main arguments and findings, any strengths or weaknesses of the source and especially their relevance to the topic of Women in Makerspaces or STEM. Writing annotations to the selected texts served as our preliminary step towards writing the literature review in this dissertation; this approach contributed to gathering and organising resources and provided a starting point for analysing and synthesising the information.

2.2 Literature Review

Once we amassed and arranged our resources, we began a comprehensive review and synthesis of the information at hand. Women in makerspaces are our primary subject of interest; however, various studies point out that most users of makerspaces have a background in STEM, which is another layer for our choice (See Section 1.2 Problem Area). Therefore, we began this literature review by examining the current state of affairs of women in STEM education in Denmark, seeking a connection between the observed lack of women in makerspaces and the number of women in STEM fields (Engmann, 2020; Faber et al., 2020).

This connection forms a key part of our wider research into the diverse and unifying themes of makerspaces, as well as trends and influences that shape women's experiences in makerspaces, thereby building the foundation for our choice of target group.

2.2.1 Women in STEM

STEM stands for Sceince, Technology, Engineering and Mathematics and is an umbrella term primarily used to group technical educative fields. According to Danmarks Statistik (Statistics of Denmark, from here on referred to as 'DST') (Engmann, 2020), in 2019, about a third (34%, See Figure XX1) of all STEM students were female, making this a male-dominated field. The most significant increase of women in one of STEM's sub-fields was a 32% growth over five years within the fields of IT, industry and robotics, resulting in this field containing about 24% of female students (See Figure XX2), matching the amount of 24% of Women in DIY communities in 2019 (Herrera et al., 2021). This field also covers IT and Communication, thereby including our own study. One reason for this disparity that DST points out is that women are more likely to go into arts and crafts, whereas men are more likely to go into science and engineering, which are seen as more maker-related (Faber et al., 2020; Smit & Fuchsberger, 2020).

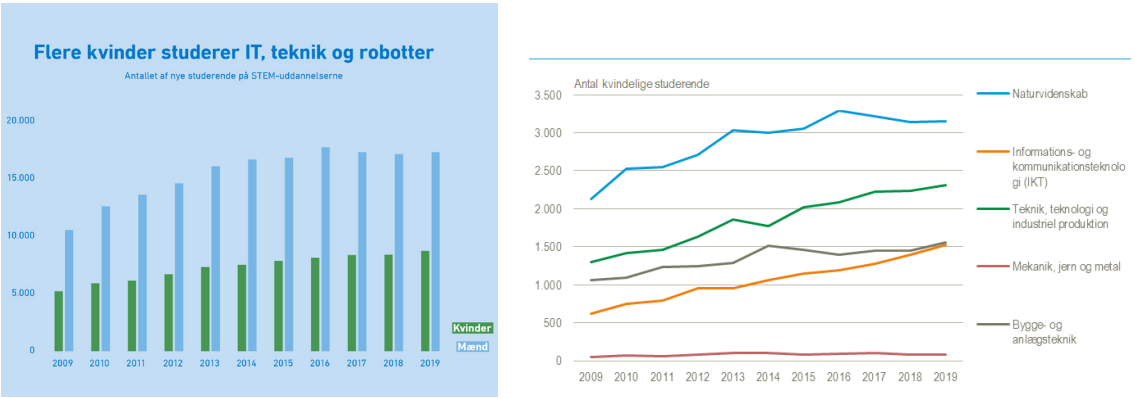


Figure 7 First graph, amount of male and female students in STEM. Second graph, number of female students in STEM, (Engmann, 2020)

Faber et al.'s literature review (2020), "Rekruttering og fastholdelse af kvinder inden for STEM: indsatser og erfaringer på universiteterne" examines the initiatives and experiences of university recruitment and retaining of women in STEM fields. The reason is a large gender disparity in favour of men, especially in studies at an advanced level, such as PhD programmes and in leading management positions. The article also presents

initiatives and recommendations for how universities can work to increase inclusivity and diversity in STEM programmes. Another purpose of the text is to highlight the barriers and challenges women face in STEM fields, with recommended initiatives on how to decrease these challenges.

The authors (Faber et al., 2020) point out a few factors that contribute to the gender disparity: (1) Stereotypes and biases contribute to discrimination and undermine women's self-efficacy and interest in the fields; (2) The lack of role models and mentors to look up to or reflect themselves in; (3) Cultural and structural barriers such as flexible working hours, work-life balance, and lack of support networks for women who want to combine family and careers; and (4) women might experience a feeling of not being seen or acknowledged, which might make it more difficult to access management positions and other career opportunities.

Initiatives the universities have undertaken and that Faber et al. (2020) have recommended to recruit and retain women in STEM fields include mentor programmes, gender quotas for researcher and educator positions, support for work-life balance such as flexible work hours and childcare facilities, recruitment activities such as workshops and campus visits, evaluations that try to avoid biases and stereotypic perceptions of applicants' qualifications, networking events, awareness campaigns and many more. If women leave the STEM workforce, it contributes to a negative feedback loop, making it harder to motivate and retain female students.

These points demonstrate important challenges to consider for our thesis and might be factors that affect makerspaces as well as possible initiatives to incorporate into our process.

2.2.2 Women in Makerspaces and DIY Communities

Before looking into the central theme of women in makerspaces, it is relevant first to introduce what a makerspace is, including the cultural significance of the maker movement, and identify who the users are (See Section 1.1 Trekanten, Bibliotek og Kulturhus for a look into our specific makerspace). This will help guide our insights to see what others have written on this specific subject or similar subjects relevant to our dissertation.

Makerspaces are places that allow people to gain access to tools otherwise unattainable. Makerspaces are part of the maker movement, which in turn is part of the larger overarching DIY (do-it-yourself) community. DIY is an umbrella term for various DIY communities, such as Hackerspaces, Makerspaces, Fablabs, and various online communities, that all have slightly varying ethos or foci (Fox et al., 2015; Kuznetsov & Paulos, 2010; Taylor et al., 2016). Kuznetsov and Paulos (2010) define DIY as "any creation, modification or repair of objects without the aid of paid professionals. We use the term "amateur" not as a reflection on a hobbyists' skills, which are often quite advanced, but rather, to emphasize that most of DIY culture is not motivated by commercial purpose" (p.1).

As technology becomes a more substantial part of our everyday lives, it has also become a new and significant part of crafting, hobbies, DIY communities, and the maker movement. Making, as understood within the field of makerspaces, has become an activity for the everyday users who do not need to be experts at crafting but who, with the help of physical and digital technologies, can craft, create and make new objects that were previously impossible for beginners of crafting and making. It is also a way for people to learn new crafting methods such as 3D printing or laser cutting, which are both techniques that have become popular and available to the hobbyist. With these kinds of skills in mind, a lot of communities, schools, and libraries, similar to Trekanten, have created dedicated makerspaces for users to work in (Einarsson, 2021).

The development and availability of new technologies and the open liberal online communities, as Tannenbaum et al. (2013), Kuznetsov and Paulos (2010), and Toombs et al. (2015) point out, are essential parts of the democratisation of technologies utilised in makerspaces and DIY communities. It is the sharing of information, transparency and open access for the 'amateur' that enables people to achieve new heights with their hobbies. Lindtner et al. (2016) point out that this new frontier in accessible technology has been critiqued because of its underlying technosolutionism. Lindtner et al. (2016, p. 1390) state that "technosolutionism is visible in promotions of making that portray it as furthering sustainability, social justice for women, economic development for the Global South, and empowerment of all". The authors further pointed out that this view "largely rests on the deployment of Western conceptions of democracy and empowerment to characterize what is in fact a global phenomenon" (Lindtner et al., 2016, p. 1391), meaning that the pervasive sentiment of democratised technology is from a very homogenous standpoint. However, this reality should not hinder research into the possible positive sides of democratised technology that has resulted in the emergence of makerspaces.

Blikstein (2013) states that educational institutes show they value certain disciplines by building facilities for those specific activities, i.e. sports halls or music halls, and that innovation and making, such as robotics labs, have not been prioritised previously, and if they were, they tended to be biased towards the male gender. Today universities and other educational institutions invest in facilities perfect for educating new makers; however, there is a noticeable discrepancy in relation to accessibility and inclusivity as one has to be connected to the educational institute to gain access to these expensive tools (See for example Pedersen, 2022 on accessibility in compulsory education). There is a political and democratic call for equity and social inclusion in relation to access to these modern technologies. The economic argument comprising the price of digital production technologies in makerspaces is closely aligned with social inclusion and democratic principles, giving the public access to machines they otherwise could not afford, as the price makes them out of reach (Blikstein, 2013).

Maker communities have been moving to communal areas and educational institutes, mainly to create spaces that can motivate more people to learn new skills, technology and form maker communities. This has led to the potential of giving support to the creativity and entrepreneurial parts of people's lives (Einarsson, 2021). In many ways, these makerspaces may be viewed as exploratory settings whose aim is to be inviting and inclusive for people from all walks of life to engage in new crafts and learn new skills for personal projects. Though this might be their intention, it has been shown in multiple instances that makerspaces mainly attract the male audience with a background in electronics and engineering (Einarsson, 2021; Smit & Fuchsberger, 2020). As stated by Smit and Fuchsberger (2020, pp. 6-7), "[…] community can be a double-edged sword, providing support and relationships to those in it, but further alienating those who are not". This can be reflected in several ways, e.g., by not feeling welcome, included, empowered or represented in the space.

A common characteristic in makerspace literature is a sense of community and the social factor related to participation; MakerSpace 9220 is no exception. The idea of community has become central to our research, based both on this literature review and the workshop with our participants. Based on our literature review, it is evident that accessibility and inclusivity of women in makerspaces form a challenge. Several of the reviewed articles point out a general shortage of women in makerspaces (Eckhardt et al., 2021; Einarsson, 2021; Fuchsberger et al., 2022, 2023; Lazar et al., 2021; Schauer et al., 2022; Smit & Fuchsberger, 2020), which is a detriment to equality and equity within maker communities. According to Eckhardt et al. (2021), Fuchsberger et al. (2023), and Herrera et al. (2021), great resources and different ways of making are being excluded, often due to an unintentionally non-welcoming environment.

Smit & Fuchsberger's (2020) article touches upon several important factors concerning community and the lack of women in makerspaces. The authors approach the subject by researching possible reasons behind male dominance in makerspaces, and they suggest

possible design solutions for increasing diversity:

> Explanations for this phenomenon – that women* are less interested in technologies and more interested in 'soft' crafts, such as sewing or knitting, or that women* are less technologically competent – conveniently overlook the fact that makerspaces are often not inviting for women* (Smit & Fuchsberger, 2020, p.1).

This phenomenon is one reason we found it interesting to research why there are fewer women in makerspaces. Initially, it interested us to see whether the space itself is a factor in that problem of exclusion, whereas later, we looked into other problem areas. Various researchers from our literature review looked into studies where others have tested possible solutions, such as women-only spaces, including hackerspaces and makerspaces. Though these initiatives might create more inviting spaces for women, they also eliminate the possibility of having a mixed-gender makerspace. As Smit & Fuchsberger (2020, p.1) point out, "the makerspaces can benefit from the individual diversity that contributes to collective benefits", and therefore, in our case, isolating gender in makerspace is neither a beneficial nor practical solution, as it would create a greater gap between the genders.

Smit & Fuchsberger (2020) approach their study with a workshop consisting of expert participants that, through design fiction and discussions, worked on alternative ways of analysing their problem. Instead of asking the expert participants how they would 'solve' the gender imbalance in makerspaces, they asked them to devise the worst ways of creating an inclusive makerspace. Their findings showcase how the maker community is rooted in an origin of a 'nerd culture' where the community members often take pride in seeing themselves as inclusive by default because the community often belongs to minority groups. However, in reality, this 'nerd' community is not necessarily inclusive by default, as it predominantly consists of white cis-gendered males. Smit & Fuchsberger (2020, pp. 5-6) also point out the following:

> We can design interventions for women* to feel more welcome in spaces in which nerd culture is dominant, but the fact of the matter is that the culture itself, and its participants, need to acknowledge its problems with exclusion and, sometimes, aggression towards other groups.

Smit and Fuchsberger (2020) describe their findings involving the concept of *maker bubbles*. The term refers to how the separation of communities, such as feminist hackerspaces, as a solution to acknowledging women in the maker movement can lead to problems of aggression towards other *maker bubbles*. It becomes a situation of 'us versus them', where those who join women-only hackerspaces might not feel welcomed in mixed hackerspaces and vice versa. Later in their article, the authors advise future designers of these spaces that when trying to make a more inclusive makerspace, one should focus on both the feminist and mixed makerspace attributes to try and build a bridge between these.

Additionally, for many women who do not feel welcome joining makerspaces, one main reason appears to be that they do not feel that they 'fit' in. In support of this view, Smit and Fuchsberger (2020) compare this situation with a person who does not know certain implicit rules native to a place, such as a new country. When in a new and unfamiliar place, it can be alienating not to know the norms of a place. This significant insight into the kind of mindset a designer should include when designing for a heterogenic audience is to show the norms in a more explicit way (Smit & Fuchsberger, 2020).

Various researchers have suggested ways to tackle gender imbalance in makerspaces, and even calling for multiple solutions (Fuchsberger, 2023). For example, Eckhardt et al. (2021) suggest focusing on awareness of issues regarding gender relations in their article by testing for diversity with a modified Bechdel test. This test focuses on testing makerspaces by asking them four questions: (1) what gender do the users identify as, (2)

does each user actively make things, (3) do they initiate and lead their own projects, and (4) is there a woman or non-binary in a management position at the makerspace? The main outcome of this modified Bechdel test is to identify and shed light on the problem, the shortage of women in makerspaces; however, without suggesting any solutions or interventions.

Breaking the *maker bubbles*, measuring diversity, or changing behaviours are all suggested solutions; however, none of the various articles above explains how to do this. We have looked at these solutions but found them lacking in specific ways of solving the gender disparity. This topic is highly complex, with multiple solutions to which we will attempt to contribute. However, we will stay aware of Smit and Fuchsberger's (2020) advice and endeavour to avoid 'sprinkling diversity' into our possible solutions.

2.3 Theory

In this section, we will unpack the primary theoretical frameworks that underpin our research question. To do this, we will scrutinise their foundational concepts, assumptions, and propositions, weighing up their respective strengths and weaknesses and analysing their relevance to our specific research context. Following this comprehensive review, we will distil the key insights from these theories to develop an integrated theoretical foundation for our study. This approach is not merely academic; it has practical implications. By meticulously dissecting these theories and their bearing on our research, we hope to illuminate the rationale behind our research strategy, thereby bolstering our findings' validity, reliability, and overall quality. A sturdy theoretical base is essential for any credible study, grounding the research in a corpus of established knowledge and ensuring that it contributes meaningfully to the academic dialogue within our sphere of Experience Design.

To begin with, we will discuss theories affiliated with our central field of study: Experience Design. This discipline underscores the necessity of crafting memorable and engaging experiences that cater to individual needs and tastes. This perspective is integral to our study, which scrutinises the user experience within MakerSpace 9220. The aim is to gain a deeper understanding and start posing questions such as what our target group expects and needs in a space like MakerSpace 9220 to feel more included and welcomed in the space. To achieve this, we will first spotlight the critical contributions of Jantzen's (2013; 2011) and Dewey's (1939) varied theories of the experience concept and Böhme's (1993; 2013) concept of atmosphere. Next, we will delve into concepts of norms with Kahneman (1999), through which we shed light on how societal norms and expectations influence individual behaviour and decision-making processes, which are also reflected differently by Schank & Abelson's (1977) concept of scripts. After that, we will explore concepts of motivation with Ryan & Deci (2000) and Apter (1989), dissecting the plethora of internal and external factors that motivate individuals to act and strive for goals. Finally, we will delve into Bandura's (1977, 1993) concept of self-efficacy, emphasising the importance of an individual's confidence in their ability to execute tasks and surmount obstacles. This aspect is critical in acknowledging and affirming individuals' accomplishments and contributions, thus nurturing a sense of belonging and belief in one's capacity.

By unpacking these diverse theories, this section will provide a solid theoretical base for our research question and aims, facilitating a holistic understanding of the subject at hand, the involvement of women in makerspaces. These theoretical perspectives each offer unique insights into how we construct, interpret, and engage with experiences. However, it is essential to acknowledge that these theories each represent just a sliver of the rich and complex tapestry that is human experience. None of these theories alone provide a complete model or perspective for viewing and understanding the world or our experiences within it. Yet, in their own distinctive ways, each contributes to elucidating various

factors underpinning the human role in experiences. As such, they serve as invaluable tools in our quest to design experiences that resonate deeply and positively with their recipients. Through the ensuing exploration of these theories, this chapter will underscore the multifaceted nature of Experience Design and its roots in diverse aspects of human psychology, behaviour and technology.

2.3.1 Concepts of Experience

The concept of *experience* has been central to numerous philosophical, psychological, and sociological discourses, reflecting the inherently complex and multifaceted nature of the concept. From early philosophical inquiries to contemporary research in Experience Design and economy, the nature of human experience and its implications for understanding our engagement with the world has remained a topic of immense importance and interest.

To point out how varied this concept is, we introduce a few different contributors to this concept and, in basic terms, introduce their perspectives on *experience*. Beginning with Kant (n.d.), a German philosopher, who theorised that experience arises from the interplay between sensory perceptions and the mind's capacity to comprehend these perceptions. This dualistic understanding presents *experience* as the basis for knowledge formation and creation, distinguishing between a posteriori knowledge derived from experience and a priori knowledge independent of experience. Dewey (1939), an American philosopher, extends the understanding of *experience* to the field of education. As seen in his seminal work, *Art as Experience*, Dewey emphasises the transformative and qualitative nature of *an* experience. He posits that genuine engagement and transformation through interaction and interpretation bring unity and meaning, marking the distinction between merely *experiencing* and reflectively having *an* experience.

The existential phenomenology of Heidegger (Wheeler, 2020) offers a different lens, viewing understanding as arising from our lived experiences. Similarly, Merleau-Ponty (2004) underscores the centrality of perception in our experiences, viewing our bodies as the medium through which we engage with the world. In a sociological context, Bourdieu's (1991) concept of habitus proposes that our experiences shape our dispositions and perceptions, influencing our behaviour and decisions. In contrast, Locke (Uzgalis, 2022) contended that the mind is a tabula rasa or blank slate upon which sensory experiences inscribe knowledge.

In the realm of commercial experiences, Pine and Gilmore's (2011) concept of experience economy advocates that businesses should stage experiences for their customers, thereby turning services into memorable events. Jantzen's (2013) aesthetic experience model also echoes this, emphasising that while experiences are subjective and cannot be directly controlled, they can be influenced by designing the frame, i.e. the context and conditions for experiences. Contemporary researchers like Hansen (2011) further extend the experience paradigm, focusing on value-based experience design as a counter to the current focus on experience economies, asking what gives experiences in the digital realm value.

In summary, the concept of *experience* is undeniably intricate, with varying interpretations across different fields and decades. A comprehensive understanding of these theoretical perspectives will be challenging to achieve as we navigate through this thesis; therefore, we have chosen to focus on only the perspectives of Jantzen and Dewey as the theories we bring in for further inquiry. As mentioned earlier, the field we have delved into is vast and multifaceted, and for this thesis to reach a conclusion, we have to be selective and restrict ourselves to fewer works as the basis for our analysis and future contribution to our research.

Experience according to Jantzen

To develop an experience-based intervention, we have chosen to examine relevant theoretical concepts from the book *Oplevelsesdesign* by Jantzen et al. (2011) and the chapter "Experiencing and experiences: A psychological framework" by Jantzen from the book *Handbook on the experience economy* by Sundbø and Sørensen (2013). These publications explain that experiences involve physical reactions, cognitive mechanisms and social opinions. Memorable experiences are shaped by an individual's desires and expectations, which can alter their preferences and self-understanding. Jantzen introduces the concepts of *change*, *wonder*, and *transform* (Jantzen, 2013; Jantzen et al., 2011).

The term *change* refers to the alteration of a person's physical reactions during an experience. These reactions can be involuntary and beyond our control, manifesting as changes in pulse, emotional response, or other physical symptoms. The outcome can be positive or negative, depending on whether the individual feels excitement, fear, or anxiety in response to the experience (Jantzen, 2013; Jantzen et al., 2011).

Wonder represents the cognitive aspect of an experience, wherein one's expectations are challenged. People often have preconceived notions about an experience based on their previous encounters. When a current experience deviates from those expectations, it triggers a sense of wonder. This process allows individuals to reassess their prior beliefs and assumptions about similar experiences (Jantzen, 2013; Jantzen et al., 2011).

The concept of transformation or *transform* refers to the lasting impact of a changed experience on an individual's future expectations and understanding. When an experience differs from what was anticipated, it can lead to new insights and modified perspectives. This transformation can alter how a person approaches and interprets similar experiences in the future, creating a new set of expectations and a revised understanding of the experience itself (Jantzen, 2013; Jantzen et al., 2011).

Jantzen's (2011) concepts on experiences advocate a user-centred approach, suggesting that experiences originate within and amongst individuals, or between the I, you and we. The value of experiences is constituted by the resonance between the experience and the individual's expectations, desires, inclinations, dreams, or fears. According to Jantzen's (2011) perspective, products are seen broadly, not merely as tangible items but as catalysts for processes that come into being. They serve as opportunities for experiences. Experiences occur when individuals engage with these products in a manner that activates, fulfils, or even challenges our dreams, expectations, or fears.

From the perspective of experience designers, their role is to influence individual feelings and senses in such a manner that users feel encouraged to reconsider and potentially alter their expectations. The inputs designers create, i.e. frames for experiences, products, and events, are experienced by users, and the outcomes of these experiences can be physiological, emotional, and cognitive (Jantzen, 2013; Jantzen et al., 2011).

Despite the ability of businesses to construct environments or frameworks for experiences, Jantzen (2011; 2013) posits that the ultimate fulfilment or satisfaction derived from these experiences resides within the individual. This encapsulates the profoundly personal and subjective nature of experiences, emphasising the individual's central role in creating and perceiving experiences.

Jantzen's theories of experience are one amongst many different definitions of this multifaceted concept. Another perspective is that of American psychologist and educational reformer, John Dewey. This following perspective is based on chapter two "Having an Experience" from his book *Art as Experience* from 1939. Even though it is an old text, his perspective is still widely used as a basis for understanding experience.

Experience according to Dewey

John Dewey (1939) presents a complex view of what it means *to experience* and to have *an experience*. Dewey proposes that these two concepts are distinct, highlighting different dimensions of our engagement with the world. The act of experiencing, or experience, is a constant, uninterrupted stream of happenings that we constantly react and respond to without thinking or sometimes noticing, and it represents our ongoing, continuous interaction with our environment. It is a dynamic process that involves perception, awareness, and action. It is, in Dewey's (1939, p. 35) words, "the very process of living". However, experiencing is not mindless; conscious intent can emerge when the self and the world meet under conditions of resistance or conflict. This idea of experience echoes Dewey's pragmatic philosophy, where knowledge and meaning arise from the direct interaction between the individual and the world. Dewey (1939) further elaborates that not all experiences are equal. Some can be inchoate, dispersed, or disconnected, lacking the unity and fulfilment of having *an* experience.

According to Dewey (1939), the act of having *an* experience is when the various elements of *experience* such as perceptions, feelings, and thoughts, come together to form a coherent, meaningful whole. *An* experience is more than just a momentary event; it is a consummatory moment that carries emotional weight and profound significance. Having *an* experience conveys a sense of wholeness and completion, where the experience, similarly to a plot, has a beginning, a middle, and an end. This experience is also marked by the feeling of being immersed and engaged in an activity, which Dewey calls an aesthetic experience.

The *aesthetic quality* of having *an* experience, as posited by Dewey (1939), serves as a distinguishing characteristic of genuinely immersive and complete experiences. Rather than simply referring to the traditional understanding of aesthetics as it pertains to beauty or art, Dewey's (1939) concept of aesthetics in experience embraces a broader scope.

He proposes that aesthetics relates to the harmonious integration of the various elements of *an* experience, forming a coherent, unified whole that is more than the sum of its parts. This harmony stimulates sensory, emotional, and intellectual engagement, creating a deeply satisfying sense of fulfilment. It is akin to a resonance that transcends the mundane and the fragmented, creating an emotionally charged, meaningful, and memorable encounter. Aesthetic quality, therefore, in Dewey's (1939) context, is a marker of the degree to which *an* experience is absorbing, unifying, and transformative, cultivating an intimate connection between the individual and the world around them.

Dewey's (1939) theories pose a significant consideration for how we understand, design, and evaluate experiences, suggesting that the full potential of *an* experience can only be realised when it is treated as an organic, holistic phenomenon that can engage individuals emotionally, intellectually, and sensually. To have *an* experience, as Dewey advocates, is to be fully present, to connect deeply with what we are doing, and to emerge from the experience changed in some meaningful way (Cf. Jantzen, 2013).

Makerspaces, like art in Dewey's view, are not separate from our everyday experiences; they are an integral part of learning and creating experiences. Dewey's *experience* could be seen as the ongoing process of exploring, tinkering, and creating in makerspaces. It is the constant learning and adaptation as makers interact with different materials, tools, and ideas. Dewey's concept of having *an* experience, as related to the goings-on in makerspaces, could be related to those moments where makers are completely immersed in their projects, so much so that the moments become distinct events in the makers' lives. This could be when a maker successfully completes a challenging project, discovers a new way of using a particular tool or material, or finally manages to exhibit a finished artwork. These experiences stand out from the daily flow of life and bring a deep sense of accomplishment and fulfilment. Having *an* experience, in Dewey's terms, means actively engaging with the task at hand, not just passively going through the motions. It is about

finding meaning and value in the process of making, solving problems, and creating something new. The process of making becomes more than just an activity; it transforms into a significant, meaningful experience.

The principles of Dewey's (1939) philosophy can be seen in makerspace environments, where making is not just a task or a hobby, but a meaningful and integral part of everyday experiences. It is through the active engagement in the makerspace that individuals can connect with their projects and collaborators, leading to profound learning and creating experiences, as well as aesthetic objects.

2.3.2 Concepts of Atmosphere

Dewey (1939) explains the aesthetic experience where one becomes immersed and engaged in the activity, whereas Böhme (1993; 2013) examines aesthetic experiences through concepts of atmosphere in his book *Atmosphere as a Fundamental Concept of a New Aesthetics* (1993), and article "The art of the stage set as a paradigm for an aesthetics of atmospheres" (2013). We have chosen to incorporate Böhme's (1993; 2013) realms of aesthetics as they relate to experiences of spaces, and in and between persons.

The term *atmosphere* is widely used in vernacular language and relates to a plethora of subjects referring to the meteorological understanding of atmosphere as layers of air surrounding Earth, or as the ambience or mood that emerge in environments, space, conversations, descriptions of rooms, landscapes, seasons or artworks and is layered with adjectives. One key feature is that the atmosphere concept refers to characteristics of things and is subjective in nature; various people may experience and characterise the same space in completely different ways. Atmosphere is shaped by our perceptions and interpretations, and is not simply a physical attribute of a space. Moreover, the concept of atmosphere can be characterised by affective or emotional qualities such as fear or joy. Böhme (1993) argues that atmosphere focuses on the paradigm of aesthetics of at-

mosphere, emphasising that atmosphere creates sensory cues. He also proposed a *new aesthetics* as a response to an aestheticisation of reality (Böhme, 1993; 2013).

Böhme (1993) emphasises the role atmosphere has in shaping our sensory and emotional experiences of the world. Böhme (1993, p. 117) states, "To perceive aura is to absorb it into one's own bodily state of being", where he leans on Walter Benjamin´s concept of *aura* to explain the relation between subject and object. The experienced aura is in this case not merely a physical property of the environment, but a subjective, embodied phenomenon that arises from the interaction between objects, light, air, and our perceptual and affective states.

Böhme (1993; 2013) argues that atmosphere can profoundly impact our well-being and sense of place, and that it can be designed and manipulated to create specific moods and atmospheres in spaces. Atmospheric experiences can point to how we as people experience the proximity of other people, objects and environments that possess qualities such as an expression, appearance, character and essence that can emotionally affect the individual.

When applying these theories to our project, it is essential to consider that Böhme´s (2013) article chiefly focuses on atmospheres on a stage within theatre. We do not work with theatre stages per se; however, one might perceive MakerSpace 9220 as our 'stage' in this research. The staging of atmosphere is particularly interesting to discuss for our analysis of MakerSpace 9220 and Art By Me (See Chapter 5. Our Study).

Böhme (1993; 2013) explains that the action of 'making' an atmosphere does not exist, because working with atmosphere does not include producing a thing; rather one can change the conditions, which then can be perceived or experienced as a specific atmosphere. He explains further that changing the conditions is more a process where the artist

or, in our case, the experience designer imagines what subjects in relation to objects and an environment will experience and if the intended atmosphere is received as such. This is an important aspect to include in our study because to design for a specific atmosphere, such as an inclusive setting, we must first understand what conditions that entails, from which perspective we understand 'inclusive', how we imagine such an atmosphere, and then set the conditions for an inclusive atmosphere to appear in, for example, MakerSpace 9220, and lastly evaluate if the users experienced the atmosphere as we imagined (Böhme, 1993, 2013).

The concept of atmosphere is ethereal and difficult to pinpoint, which makes it an interesting and challenging factor to include in the design and evaluation of our study. It is essential to remember that; "atmosphere itself is not a thing; it is rather a floating in-between, something between things and the perceiving subjects" (Böhme, 2013, p. 4). As mentioned above, atmosphere is something floating between subjects and objects, and we, as designers, can manipulate various conditions within a space with the intention of affecting how an atmosphere appears in a specific way; however, it is ultimately up to the perceiver to judge if the atmosphere is perceived as intended. We can merely help guide an experience towards a certain direction with certain values and priorities in mind. Again, for MakerSpace 9220, we might imagine a certain atmosphere and aim to design frames to produce how it appears; however, it is uncertain how the possibly altered atmosphere might be sensed by the users of the space.

Including Böhme's (1993; 2013) concepts of experience and atmosphere will help guide our research and thought processes for more nuanced insights into the perceived atmosphere of MakerSpace 9220, how we analyse the space, what set conditions in the space affects the atmosphere as it appears, and how attempting to understand the 'floating in-between' between us, our participant, regular users and MakerSpace 9220 might help our design process.

2.3.3 Concepts of Norms and Scripts

For a different perspective on understanding everyday experiences, we chose to look at Kahneman's (2003) and Schank and Abelson's (1977) works, as these attempt to explain the steps that happen in a human while it experiences and what factors affect if one chooses to stay or leave an unfolding event.

In this first section, we explain Kahneman's (2003) concept of *norms*, both general and individual, *utility* and how we perceive this as a usable concept to utilise in our analysis of MakerSpace 9220 and the *norms* which the users have developed there. Then we continue to Schank and Abelson's (1977) *scripts,* where they describe how every person has a *script* that they follow throughout their life and how these, by way of organising and analysing day-to-day actions, grow, change and become the new normality. We also describe how this might be used for understanding what scripts or day-to-day normality are apparent in MakerSpace 9220.

Norms

Similar to Dewey's (1939) definition of *experiencing,* Kahneman (2003) explains *norms* in the sense that reality is continuously experienced, thereby constantly generating norms. To the experiencing person, norms are something that is seen as normal and regular in that specific situation. Norms are based on a person's previous experiences or the repetition of events. When an event deviates from the norm, defined as a *norm break*, it can result in an emotional response. The emotional response depends on the individual and the specific situation, whether that which broke the is surprising, disappointing or entirely else. Events that differ sharply from the norm can be seen as surprising or novel (Kahneman, 2003).

Kahneman (2003) is very utilitarian in how he explains experiences, which in some aspects can be perceived as reductive of this complex term. However, he has a few interesting points in how one can view and explain why people choose to leave or break off the experience they are currently in the process of. He explains that all experiences are evaluated constantly as either *good* or *bad*, and that they are based on hedonic and affective impressions. He posits that experiences are accepted or denied through the concept he defines as *utility*. When the *utility* of *an* experience is accepted, it is seen as useful to the experiencer, which results in a starting or continuation of an event, whereas when denied it can be viewed as useless and will be stopped or not started. He further divides the concept of *utility* into two parts; *instant utility* and *remembered urility*.

Instant utility, is the attribute, explaining the present moment that constantly is being experienced. The one *experiencing* decides if one wants to continue or end the experience. Here Kahneman (2003) argues for an addition of the *good/bad* scale, where he posits that the experiencer only evaluates the experience as either a positive or negative.

Remembered utility is a more overall and reflective evaluation of the experience. This happens when an individual looks back on *an* experience (Cf. Dewey, 1939), where they can look back on it and conclude if the overall experience is seen as *good/bad* (Kahneman, 2003).

Kahneman (2003) explains this hedonic good/bad scale as where an individual continuously thinks and feels in an ongoing experience and evaluates that particular moment. According to Kahneman, it is the subjects feelings and thoughts that hedonic evaluate every small experience. The *good/bad* scale therefore is used for one's *instant utility* which defines one's *subjective happiness*. This *subjective happiness* is one's happiness in that moment, whereas the objective happiness can be found over a period of time. These become the *total utility* and give an overall look upon one's evaluation of an experience.

While Kahneman's (2003) norm theory uses a scale to evaluate whether *an* experience is perceived as either *good* or *bad*, we believe this to be a slightly superficial understanding of the complex processes that occur within a human being. Therefore, in this thesis, we will use Kahneman's *utility* as a spectrum since we interpret *an* experience as neither good nor bad, it can contain both parts simultaneously, as well as contradicting, frustrating and correlating feelings, all at the same time. This means that the *utility* of *an* experience can continuously fluctuate and change over time, and therefore the good, bad or more complex feelings will not be the same throughout an experience.

In Chapters 5 and 6, we will examine and interpret on the participants' observable norms in the space and evaluate if we can affect the everyday experience users have at MakerSpace 9220. In general, we intend to change individual's norms in an attempt to increase women's awareness of the space, and to examine and review the existing norms in MakerSpace 9220.

The following section examines scripts, as this concept is closely related to Kahneman´s (2003) norm theory.

Scripts

Schank and Abelson's (1977) theory of scripts is similar to manuscripts and, for example, how a computer programme runs. Their view of understanding processes is an interesting way of examining how people act and react in given situations, which we can apply to our research. The authors divide the understanding process into two classes of knowledge, *general knowledge* and *specific knowledge*.

General knowledge enables one to understand and interpret normal events, happenings and interactions with and within the world, e.g. one knows that when another person reaches out their hand, one should accept it and shake that hand accordingly (Schank and Abelson, 1977, p. 37).

Specific knowledge is used to interpret and participate in events one have experienced many times before. The specific detailed knowledge about a given situation makes one process and wonder less about the different parts of the event. Scripts are intended to account for specific knowledge and are an important part of understanding an experience (Schank and Abelson, 1977, p. 37).

There are scripts for every event, inter-personal relation, contextual situation, and experience. However, scripts are highly detailed in the sense that there is not just one script for a restaurant; there is a plethora of script for each instance of a restaurant, e.g. fancy restaurants, fast-food restaurants, theme-based restaurants, and each has a different script. Scripts contain paths or scenes; for example, the restaurant script has the entering scene, ordering scene, and paying scene. The script is always written from an individual's point of view, meaning a script for a restaurant is different depending on if one's role is a customer, waitress or chef, and therefore the individual's experiences of restaurants will always differ (Schank and Abelson, 1977).

One can have more than one script active at the same time. In the case of a person travelling on a plane, a script for travel, a script for a bus, as the interior of a plane is similar to a bus', and a script for being serviced, are all active (Schank and Abelson, 1977). When more than one script is active simultaneously, the incoming information will compete with the other, where some information might not fit in either of the scripts. For example, a makerspace script would be a competing script as it is both a workshop, a community where people help each other and a design and entrepreneurial facility, which all can have different scripts if separated instances (See Chapter 6 Discussion).

Sometimes the scripts will have some deviations, that are quite similar to a norm break (Cf. Kahneman, 1999). The script's deviations are when one is experiencing something unexpected or something different than what is normal for the script, for example, when

a disruption happens or when someone or something prevents one from continuing the script's path (Schank and Abelson, 1977).

The scripts will always develop, and new information will be built on top of the old information, and therefore one's scripts will change over time. For example, if a maker-space changes how one pays for materials, it will be updated and become part of one's new script for paying for materials in makerspaces. Scripts are informed by individual's past experiences, and when one is experiencing new or different things, the scripts might change or new scripts might appear (Schank and Abelson, 1977).

In this thesis, we will use the concept of *scripts*, sometimes in extension of *norms*, to investigate which scripts the users of MakerSpace 9220 have, and how we can change the scripts, especially women's scripts, so they might perceive MakerSpace9220 as an interesting and inviting space in which they can explore their creative efforts.

2.3.4 Concepts of Motivation

Continuing to concepts of motivations, the reason for including this aspect into our research is to partly understand how intrinsic and extrinsic motivations functions within humans with the intent of utilizing this understanding to consider and develop on ideas for how we might motivate more women to attend and become part of MakerSpace 9220, as well as dig into what currently motivates women to participate in the space. To begin with, we explore Richard M. Ryan and Edward L. Deci's (2000) self-determination theory which hinges on innate psychological needs they posit all human beings have. This will be followed by Michael J. Apter's (1989) *Reversal Theory*, in which he has developed a model for understanding various states of motivation.

Self-determination theory by Ryan and Deci (2000) describes that people have three innate psychological needs: *competence, autonomy* and *relatedness*. When these three psychological needs are satisfied, according to the theory, it will increase self-motivation and mental health; however, when not satisfied, it will lead to diminished motivation and well-being.

Competence refers to developing and using one's own abilities and feeling competent. Autonomy refers to deciding for oneself what one does, the feeling that one has a choice and does not feel forced to do something that they do not want to. *Relatedness* refers to a person's wish to feel connected to others, and that others are connected to oneself (Ryan & Deci, 2000).

When these three innate psychological needs; *competence, autonomy* and *relatedness,* are satisfied, it leads to being motivated, personally satisfied, and feeling a sense of well-being. Beyond psychological needs, Ryan and Deci (2000) also focus on motivation and categorises this concept into two types of motivation: *intrinsic* and *extrinsic*. *Extrinsic* motivation is affected by external factors such as competition, rewards, and punishments. *Extrinsic* motivation is furhter divided into four subcategories, *externally regulated, introjected regulation, regulation through identification* and *integrated regulation*. The four subcategories are on a scale from *external control* to *interior autonomy*. *Intrinsic* motivation is affected by internal factors such as doing something for one's own sake, pleasure, interest, and desire. When a person writes an assignment based on intrinsic motivation, the interest for making it is more sustained, and the solution might be more creatively made than if the motivational factor is *extrinsic* (Ryan & Deci, 2000).

A different perspective is Apter's (1989) take on the concept of motivation, which is hedonistic in nature. According to his theory, motivation can be graphed on two axes; the level of arousal (high/low) is on the horizontal axis and the level of the hedonic tone (unpleasant/pleasant) is on the vertical axis. Depending on these levels, one can enter the dichotomous states of boredom/excitement and anxiety/relaxation.

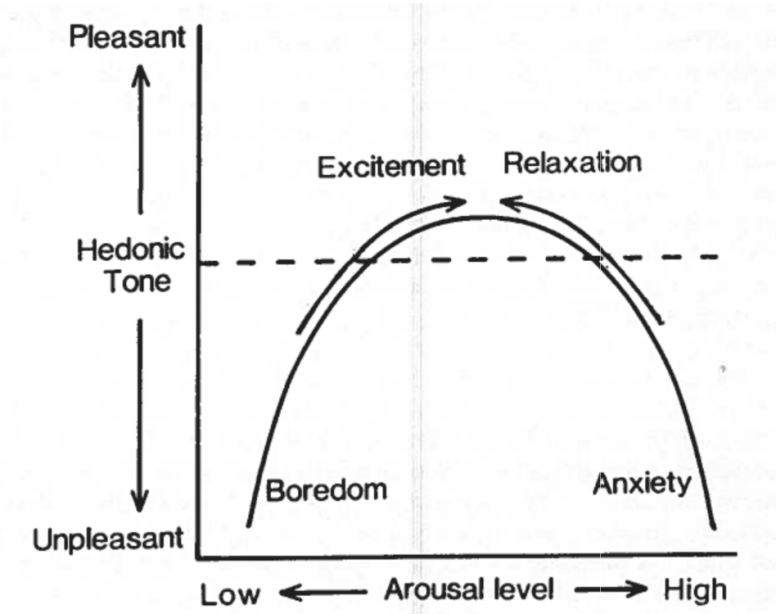


Figure 8 Graph of reversal theory (Apter, 1989, p. 11)

This graph includes two variables: the intensity variable - how high or low the level of arousal is, and the hedonic tone – how pleasant or unpleasant the arousal is (Apter, 1989, p. 10). These two variables have four combinations of the arousal level and the hedonic tone: *anxiety* (unpleasant, high arousal), *excitement* (pleasant, high arousal), *relaxation* (pleasant, low arousal) and *lastly boredom* (unpleasant, low arousal) (Apter, 1989 pp. 10-11). According to Apter (1989) there are two different paths to enjoyment depending on the level of stress one is experiencing in the situation. The *anxiety-avoiding,* also known as *telic* state, and the *excitement-seeking*, also known as *paratelic* state. The *telic* state is when one's actions are goal-oriented and enjoyment occurs when one has solved or reached the goal. Therefore, when doing an action with *telic* motivation, the goal is the primary motivation, and doing the action is the secondary. When working on a task with a *telic* state, one will solve the task in the fastest or best way possible to reach the goal.

Paratelic state, on the other hand, is the reverse. When one is in the *paratelic* state, the action itself is the goal, therefore enjoyment is in doing the action and not in reaching the end or goal. When one is in a *paratelic* state, one does not focus on solving the task, but is immersed and might forget time and place. One cannot simultaneously be in the *telic* and *paratelic* states as one's motivation is measured, but one can shift from the one state to the other during an activity (Apter, 1989).

Ryan and Deci's (2000) and Apter's (1989) concepts of motivation differ, but they all give various perspectives of how we can try to understand our participants motivations and those of the regular users of MakerSpace 9220. They give insights into how our participants might change motivational states during an activity, e.g. are they in a telic state where they focus on reaching the goal, or creating the object which is the task; or are they in a *paratelic* state and enjoy simply being there and doing the activity, forgetting the time. Another question to ask is, are the participants intrinsically or extrinsically motivated to attend the workshop or during it. On which axis are the participants situated: are they relaxed, bored, or excited during the workshops, and do they switch between these at various intervals. These are all interesting aspects that might factor in as we try to understand what drives and could potentially drive users, particularly women, to participate in makerspace activities.

Lastly, Ryan and Deci's (2000) psychological needs, *competence, autonomy* and *relatedness*, tie well into Albert Bandura's (1977) concept of self-efficacy and what drives people to be part of spaces such as MakerSpace 9220.

2.3.4 Concept of Self-Efficacy

The term self-efficacy originates from Canadian-American psychologist Albert Bandura (1977; 1993) and is described as a person's belief in their ability to succeed in a particular situation. Self-efficacy is how one builds up the belief that they can do things and increases confidence by believing that one can act on the ideas one has. Self-efficacy is important to understand when working with women in male-dominated fields such as makerspaces (Cf. Section 2.2.1 Women in STEM) because it is highly reliant on the belief one's has in own competencies and others' (See Chapter 6 Discussion, where we delve deeper into this topic).

Bandura (1977; 1993) divides self-efficacy into four components which point out how raise one's own and help others' raise their self-efficacy and self-confidence. Self-efficacy concerns personal 'action confidence', i.e. expectation of one's competence to carry out a certain action. It concerns expectations of what one thinks one can do, not what one actually can do. This distinction is important because individuals tend not to do things they think they cannot. There can be several reasons why a person thinks they cannot do things, e.g., past bad experiences can lead to low confidence to act.

The four components mentioned above, can lead to an increase or decrease of self-efficacy. The component are *performance accomplishments, vicarious experience, verbal persuasion*, and *physiological states*. Performance accomplishments are the primary source to heighten or lower self-efficacy and is based on personal mastery-experiences and can be measured by successes and repeated failures. Successes raises the mastery-expectations and repeated failures lower them. If there are multiple repeated successes the self-efficacy will become strong, and therefore negative impacts from failures become less likely to reduced it. The timing and the total pattern of experiences is important to reduce the negative impact of occasional failures. Failures that are later overcome by determined effort can strengthen self-motivated persistence. If one experiences success

with a task, the obstacle perceived in such a task will be smaller the next time one does it. In that way one will slowly but steadily become more robust as long as the successes overcome failures (Bandura 1977; 1993).

Vicarious experience is based on reflecting oneself in others; if others can do something, one should be able to do it as well, and if others improve one should be able improve too. In other words, social comparison. The gains achieved by effortfully copying others' behaviours minimises the negative impact of temporary distress and demonstrates that even the most anxious can succeed through perseverance. Observing a role model perform an activity successfully will produce greater behavioural improvements than observing the same performances without any evident consequences. It does not matter if one observes another in real life or, for example, through an instruction video, and it is not necessary for one to have the things in the hands. If people with different characteristics can succeed, then one will have a reasonable basis for increasing one's own sense of self-efficacy. When role models tell their story of how they successfully completed something, one will be inspired of the story and the story will give a down to Earth on how to do it, then it becomes easier to understand how to proceed (Bandura 1977).

Verbal persuasion is aimed mainly at raising outcome expectations rather than at enhancing self-efficacy. Verbal persuasion is widely used when attempting to influence human behaviour, because of its ease and availability. One is being led to believe that they can cope successfully with things that have been overwhelming them in the past. When attempting to raise another's self-efficacy, it is important to use examples from the receivers previous successful experiences and tell them of the things the supporter can see they are competent at, as they only need a little verbal support to help them accomplish similar tasks, e.g. when a supervisor points out, supports and encourages a group to achieve

success with a project. Attaining no verbal persuasion can end badly, and undergoing a negative experience with a failure might make the same task more difficult to accomplish again. This kind of efficacy expectations are likely weaker than those arising from one's accomplishments (Bandura 1977).

In accordance with *physiological states*, it is important to understand one's body, why it reacts the way it does and when. Sweaty palms and heavy breathing are mostly associated with negative feelings of panic and wanting to escape the situation that made the body react physiologically. However, this reaction might indicate that the body being ready to accomplish a certain task, such as being nervous about an exciting event. One should become aware of the physiological signs of discomfort such as a shaking voice and heightened heart rate and recognise the possibility of escaping this feeling through revelling in the feeling or interacting despite it. Understanding the physiological and physiological things that happen in one's body is important and working with these will help one in various hard situations. Nervousness should not be negative and should not hold one back from doing things (Bandura 1977).

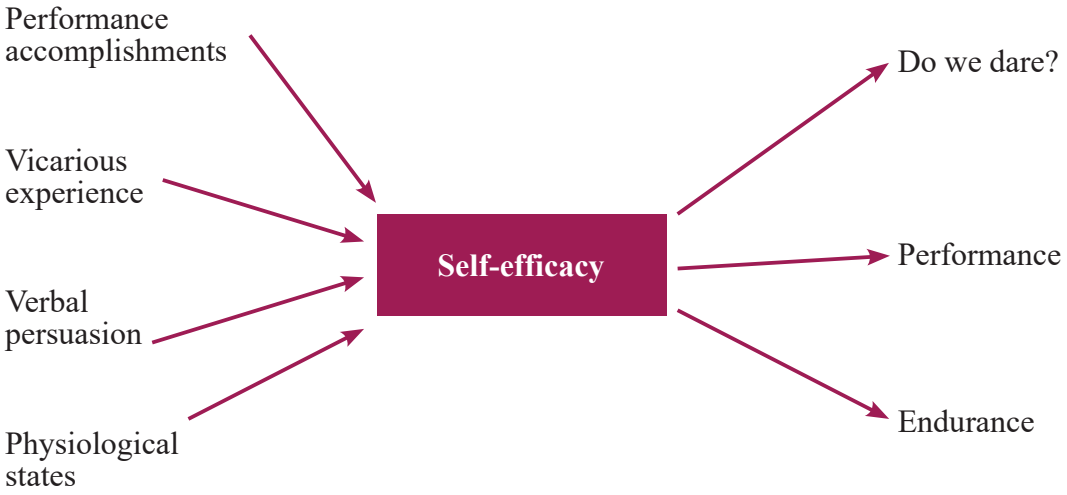


Figure 9 Overview of the four components and their impacts (Own Picture)

These four components can be practiced, and together, they can ensure a higher level of self-efficacy if one succeeds. With the four components, one can also help others improve their level of self-efficacy. But, the four components can also be used in a negative way, if one has a negative role model, one's self-efficacy can decrease (Bandura 1993). The degree of self-efficacy also says something about one's performance. If one has high self-efficacy, one will perform better and seem confident during, for example, an exam situation. The opposite also applies if one has low self-efficacy, one will perform worse. The degree of self-efficacy also indicates whether or not one dares to do something that seems difficult for one. When faced with a situation where one feels stressed, one might think one can handle it because one usually does, i.e. if their level of self-efficacy is high. When the level of self-efficacy is high, one tends to throw oneself into things, whereas if one has a low level of self-efficacy, one will write off the opportunity because there is no reason to do it (Bandura 1993).

An individual's efficacy expectations determine how much effort one will expend and for how long one will persist in an experience. The stronger ones perceived self-efficacy is, the more active one will be. The endurance is also a factor when discussing high and low self-efficacy. If one has high self-efficacy, one tends to endure more while if one's self-efficacy is low, one's endurance will be low and one might give up sooner (Bandura 1977).

When doing something new or out of one's comfort zone it is not only a question of being motivated (Cf. Section 2.3.4 Concepts of Motivation), but also a question of believing that one both has the cognitive resources and the skills to be able to do it – to know how to do it and know that you can do it is important. In other words, one's belief in own capabilities can mobilise the motivation, cognitive resources, and courses of action needed to meet given situational demands. Having had a bad experience before can hold one back from doing things; a notion that something is too difficult excludes one from practising or doing it (Bandura 1977; 1993).

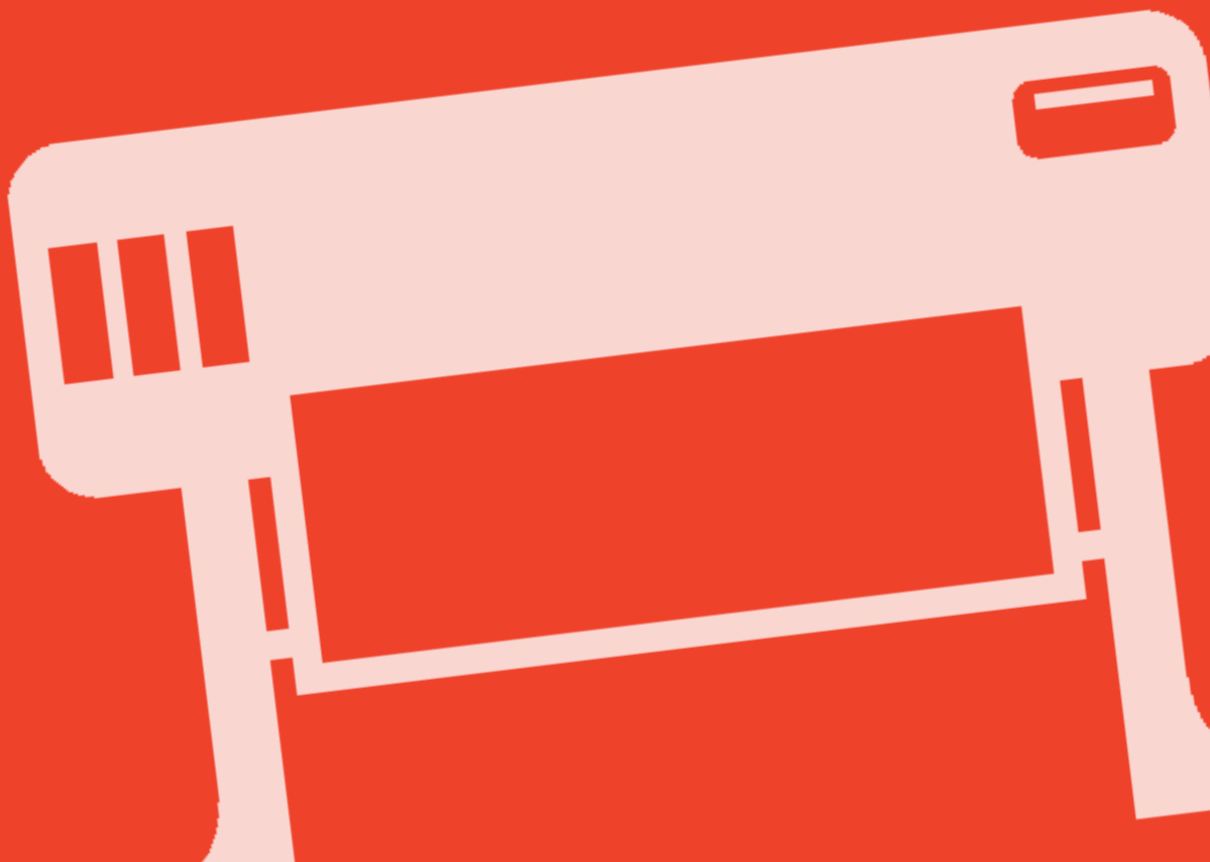
There can be consequences with both high self-efficacy and low self-efficacy. If one has high self-efficacy and makes a mistake, one might think that the mistake has been made because one has not practiced or rehearsed enough despite having practiced more than enough. One might think that one mistakes makes the whole performance insufficient, and one might always feel that one has not practiced enough. On the other hand, the consequences of low self-efficacy might be that one feels one has poor abilities, and that one as a person cannot do anything, possibly resulting in sitting at home alone every day, never going out and making any new successful experiences or being challenged to try out new things and gain new experiences. One might feel that since one cannot, why should one practice? (Bandura 1993).

Bandura's (1977; 1993) concept of self-efficacy serves as a compelling lens through which we can understand individual perceptions of competence and ability, particularly as it pertains to women navigating male-dominated fields such as MakerSpace 9220. Self-efficacy and its elements are crucial in shaping how one perceives their potential for success or failure. While high self-efficacy can lead to overestimation of personal capabilities and subsequent disillusionment, low self-efficacy can breed inertia and avoidance of new experiences; hindering personal growth. Understanding self-efficacy as a possibility for personal development, where one can cultivate resilience and self-confidence, can also point out this concept's role in the larger discourses surrounding gender equity in STEM fields. Moreover, a nuanced understanding of self-efficacy and its implications is necessary to mitigate its potential downsides, ensuring its role becomes a tool for empowerment rather than a source of self-doubt or unreasonable self-expectations.

2.4 Part Conclusion

In conclusion to this chapter, our literature review and theoretical exploration, where we dived into literature related to STEM, makerspaces and DIY communities, and theories related to experience, atmosphere, norms, scripts, motivation, and self-efficacy, each offer distinctive insights that collectively paint a more comprehensive picture of the phenomena under investigation and laid the groundwork for our study. This whole chapter foregrounds the complexity of our subject matter, highlighting the need for a multi-pronged approach to fully grasp the intricacies of our problem area; women's engagement in Makerspaces. While we acknowledge that the scope of our research cannot encapsulate every facet of this multifaceted phenomenon, the theories and literature adopted for this study aim to offer diverse perspective, concepts and models through which we attempt to interpret and understand our findings. With this chapter, we have strived to illuminate how these theories and prior research work together to provide a robust exploration of women's experiences in makerspaces, helping pave the way for further studies, including our, in this critical area of gender equity in STEM and makerspace communities.

3. Definition of Terms



3. Definition of terms

Women

When using the word women, we mean including women, queer, non-binary, transgender, and intersex people alike. This concept also contains many more implications such as socio-cultural, immigrant, mother, non-Danish/Danish speaker, young and old, not only a woman. Marginalised in some areas, white privileged in other areas.

Gender inclusive

When using to the word 'gender inclusive', we refer to all genders, but focusing mostly on the minority groups. In English inclusive touches upon gender, race, disability where in Danish it refers to handicap and cognition.

Makerspace

A makerspace is a public workshop, where makers, as they call their users, can share tools and knowledge. Makerspaces are known for their communities, where everyone helps everyone. When makerspace is mentioned, we also include hackerspaces, Fab Lab and DIY communities.

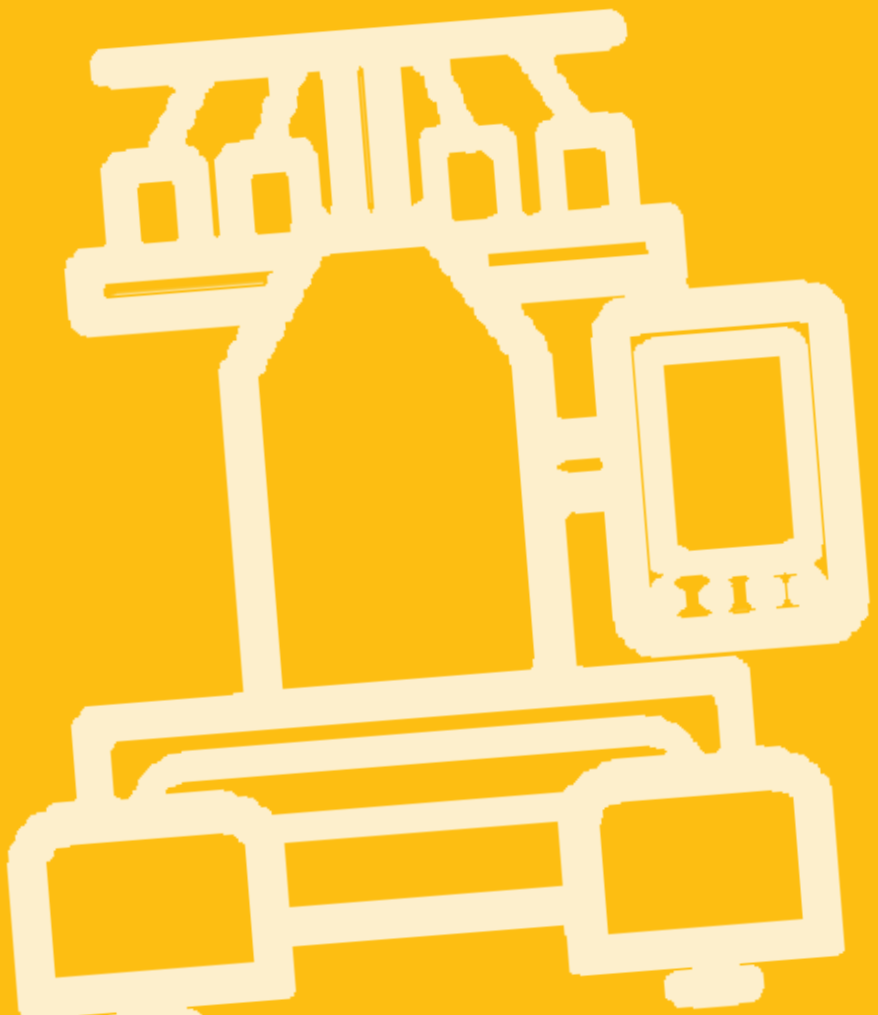
Superusers

When using the term, we use it differently than compared to how MakerSpace 9220 uses it. Instead of a specific group of volunteers ie. MakerSpace 9220's term, we use it occasionally to describe current users of the makerspace.

Comfort/Security

When using either comfort or security, we roughly translated it from the Danish word 'Tryghed'. Therefore, when we use those terms, we refer to several English words simultaneously, Tryghed encapsulates more than just safety or comfort, it also refers to a sense of security, a trust in other people, being physically secure, safe and comfortable.

4. Methodology



4. Methodology

This chapter outlines the overall research design of our study and the methodological approaches used. Details on our research participants, context and how the study was organised and conducted, are provided in Chapter 5. Our Study. As this thesis primarily relies on qualitative data, we first provide an overview of key features of qualitative methods and give the rationale for adopting a mixed-methods qualitative approach to guide our inquiry. One part of our mixed-methods approach was a single quantitative method in the form of an online questionnaire, where the aim was to gain insight into the current maker community. Then, we outline the chosen methods that we drew inspiration from on our collaborative research journey and adopted for our data gathering activities and, subsequently, our data analysis (See Chapter 5. Our Study). Our aim was to find suitable methods to gain insight into women's experiences in MakerSpace 9220. Through intervention initiatives, our main goal of this project is to understand and address the gender gap in makerspaces, and to increase the number of women in the makerspace community at Trekanten. In short, our aim is to get insights into what it takes for a makerspace to get more women to join and to make it more attractive for women to engage in makerspace activities.

The word qualitative, as described by Denzin and Lincoln (2008, p.14), "implies an emphasis on the qualities of entities and on processes and meanings that are not experimentally examined or measured (if measured at all) in terms of quantity, amount, intensity, or frequency". In contrast to quantitative research, often described as 'hard' science that claims to be value free or objective, qualitative research is the 'value-laden', subjective and socially constructed nature of reality that shape the inquiry of qualitative researchers.

Rather than reducing qualitative research to a set of prescriptive principles, it may be portrayed as representing a wide range of intellectual and disciplinary traditions and conversations. With emphasis on a broad understanding of qualitative research that informs

this study, including phenomenology and hermeneutics, qualitative research can be understood as a situated activity that allows researchers to study social phenomena in their real-life settings. The term *situated* refers to the specific social phenomena, conditions and contexts in which the processes we, as researchers, are interested in, are unfolding. Regarding this ontological position, Denzin and Lincoln (2008) offer the following generic definition of qualitative research:

> Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices can transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meaning people bring to them (p. 4).

This generic definition contains key elements of qualitative research, which this thesis draws on. These include being participant-centered, situated, exploratory and interpretive. A main aim of qualitative research enquiry is therefore to build detailed accounts of the situated practices of particular social actors – in our study: women in makerspace - and to show how they, research participants themselves, understand and narrate their lived experiences. This is commonly referred to as an 'emic' perspective (Mørck, 2016). Applying an emic perspective basically means giving voice to research participants, using their words and thus being acutely attuned to participants' points of view. In summary, qualitative research thus focuses on how people see the world and how they make sense of it. In order to gain that insight, researchers need to engage in conversations with people, e.g. through interviews, hear what they say, make sense of what they say and do,

but also to observe what they do and say, as described in the methods section below. To do so, a researcher is never objective or invisible, but through conversations with focal participants, a researcher is part of the conversations and is thus a co-producer of knowledge. This is briefly what undertaking qualitative research is about. In contrast, quantitative research, as the term indicates, focuses on gathering statistical data, such as in the online survey (Møller, 2016) we conducted with the purpose of gathering numerical data on the current and past users of MakerSpace 9220.

From this broad overview of central features of qualitative research, and a glimpse of a quantitative method, the next section will include a more detailed description of each of the chosen qualitative methods and a rationale for adopting each of them. These methods include the following: The Experience Matrix by Hird and Kvistgaard (2010) and a method known as T-H-E-M-E by Pine and Gilmore (2011). Both approaches aim to explore and describe an experience room. Then, focus is on the observation method as a method to explore and describe participants' behaviour in MakerSpace 9220, and to follow up our own observations of participants, we include a semi-structured focus group interview. Lastly, an overview of the analysis method known as Affinity diagram will be described. Brought together, these different methodological approaches are all adopted with the aim of gaining further insights into our research topic.

4.1 Experience matrices

The experience matrix is a qualitative method used for discovering, exploring, describing and understanding an experience room. It is a simple and systematic method developed by John Hird and Peter Kvistgaard (2010), with its starting point in Joseph Pine and James Gilmore's *Field Guide for the Experience Economy* (2011). Hird & Kvistgaard's experience matrices provide a structured way of categorising different aspects of an experience.

The experience matrices are influenced by the philosophies of phenomenology and hermeneutic processes and can provide a valuable framework for analysing an experience room. The experience matrix consists of five matrices. In the first matrix, one notes down the characteristics of the room one is analysing. What does it consist of? What do you notice? What are the essential characteristics? What are your immediate thoughts? What are your deeper thoughts? (Hird & Kvistgaard, 2010 p. 87).

The second matrix contains a radar diagram where one gives the five types of experiences a rating and a comment that substantiates the rating given to the experience. The five types of experiences are aesthetic, entertainment, action, learning and enjoyable experiences. (Hird & Kvistgaard, 2010 pp. 88-90). These five types are heavily inspired by Pine and Gilmore's (2011) 4e's but modified to include more facets particular to describing experience rooms.

The third matrix focuses on the six senses: smell, taste, touch, hearing, vision and lastly, gut feeling. These should then be individually described and then rated on another radar diagram. The sixth sense, the gut feeling, is difficult to describe, but the questions one can ask oneself are: does it feel nice? Do you like to be there? Does the room give you a good gut feeling? (Hird & Kvistgaard, 2010 pp. 90-91).

In the fourth matrix, one is meant to describe the narratives in a room. According to Hird and Kvistgaard, it is the narratives that make the content stand out and what might make an experience memorable and exciting. The experiencer has to describe the actual narratives, which include signs, boards, posters, or other straightforward visual cues. One should also note the indirect narratives, as in what does the experience room indirectly tell one? In the last part of the fourth matrix, the experiencer should write down which narratives one wishes the experience room would tell, as in the imagined future narrative (Hird & Kvistgaard, 2010 pp. 91-94).

The fifth matrix is divided into two versions: A and B, where A focuses on music in the experience room and B on the economic potential of the experience room. The users of this methodology decide which version is more useful for their experience room (Hird & Kvistgaard, 2010 pp. 95-98). Version B is an assessment of whether the investors' investments might pay off in the experience room, but it is also an assessment of whether the customers get an experience with added value, insofar as the experiences exceed expectations. The fifth matrix version B is an assessment of whether the experience room has potential to be or become competitively differentiated and customer relevant. In this matrix one should rate the seven topics (commercial mindset, overall good experience, high price, involve other industries, enough customers, willingness to pay, long-lasting experiences) and comment on them (Hird & Kvistgaard, 2010 pp. 95-98).

The Experience Matrices focus on the first-person experience of the room's visitors, examining how they perceive, feel, and interpret the different aspects of the room. This can help identify the experience's most meaningful or impactful elements for visitors. As such, Hird & Kvistgaard's (2010) experience matrices can provide a useful tool for categorising and analysing the various aspects of experiences, such as the sensory, emotional, economical, and intellectual dimensions. This can help identify patterns and themes in visitors' experiences and areas that may need improvement.

4.1.1 T-H-E-M-E

From using the experience matrices, it is then interesting to introduce the T-H-E-M-E method. According to Pine and Gilmore (2011), the aim is to look for the 'Best Principles' in other experiences, examine those principles, extract the essence from them and then apply these to one's own business enterprises. They also advise users to look at bad experiences to examine them, extract the principles and then avoid doing the same in one's business. This process of learning from existing examples of good, middling and poor business ventures, in a very simplified sense, is one foundational element of what being an experience designer entails.

Pine and Gilmore (2011) also state that every experience has a theme. The theme might be intentional or not, be well designed or not, and might be thorough or not. Nonetheless, an experience always has a theme. Based on this proposition, they created a method called T-H-E-M-E that one might use when visiting any venue. The letters in the name T-H-E-M-E stand for the following:

T: Theme the experience

H: Harmonise impressions with positive cues

E: Eliminate negative cues

M: Mix in memorabilia

E: Engage all five senses

This is a method to structure an observation and analyse a space. The intention of including both the Experience Matrices and the T-H-E-M-E methods is to gain a deep and nuanced understanding of MakerSpace 9220 and other creative or workshop-related spaces based on the phenomenological and hermeneutic lenses that both methods are inspired by. With these methods, we intend to identify the worst principles, extract the best principles, understand the tradeoffs, and become inspired by how these are implemented in various creative spaces, which, lastly, will be used to analyse and improve our project.

4.2 Observation method

This section focuses on the observation method as a qualitative data-gathering method. With our hermeneutic and phenomenological approach applied in this thesis, we have chosen observation as a way to interpret the human experience (Rosfort, 2019), mainly by observing participants and watching, feeling and sensing the experience within (Aagaard & Matthiesen, 2016). Observation is a research method used to systematically watch and record behaviour and social phenomena in natural settings. Using these principles, the participant observation is a way to unfold the mundane narratives, and to understand the silent interactions with the world. Instead of using interviews as a

preferred research method, which in many cases only focuses on the verbal interaction, undertaking an observation is a way to see the social interaction and the interactions with the material presence (Aagaard & Matthiesen, 2016). As Tanggaard argues, "creativity exists in the dialectical relation between individuals and materials" (Tanggaard in Aagaard & Matthiesen, 2016, p. 43). Observations are therefore a way to give a voice to materials situations, treating objects as actors. As observed by Aagaard & Matthiesen (2016, p.40), "The qualitative interview privileges the voices of human actors, but things remain mute".

As written in chapters 3 and 4 about observations in *Kvalitative Metoder* (Raudaskoski, 2015; Szulevicz, 2015), observations can be made in various ways. This might be in different places and with different technological add-ons, such as with a camera or a recorder, depending on what kind of data needs to be gathered. Then one can choose the preferred technology and locations for the observations. Moreover, as emphasised by both Raudaskoski (2015) and Szulevicz (2015), superficial observation can be divided into two types of observations. The first is 'experimental observations' which are observations that happen in secluded areas, where unwanted influences are minimised. In this method, one can have more control over the relevant variables for the scenarios one wants to observe. The second type is 'participatory observation', which, as they describe it, is where one, as the observer, is observing the participants in their normal surroundings. It consists of the observer switching between primarily observing or fully participating in the activity (Szulevicz, 2015).

Though the authors seem to prioritise this method of participatory observation instead of the experimental, they do have some critique of using the participatory observation. First of all, the observers' credibility and validations of the observations are questioned, as the observations will be influenced by the observers' personal opinion on the experience. This is important to highlight as even though it might be more prevalent in the partic-

ipatory observation, it will also be relevant when doing experimental observations, i.e. the observers' observations are always subjective, as mentioned in the beginning of this chapter. This means that when analysing the gathered data, it will aways be influenced and therefore the credibility of the data can be challenged (Szulevicz, 2015); however, this is the essence of qualitative research. Additionally, through the text 'Using participant or non-participant observation to explain information behaviour' (Cooper et al., 2004), the authors differentiate between *participant* and *non-participant* observations. When observing, the researchers must build some form of trust between participants and the observer, where both the participants or research subjects and the researcher are aware of the research process. To increase trust in a non-participant observation, giving access to the study structure can ease the participants in sharing information. In addition, it is important here to comply with guidelines, such as GDPR, on research ethics, as we have done through consent forms and by handing the participants necessary information about the objectives of the study and information of the use of data (Cf. Section 5.2 Workshop).

When using a *non-participant* observation approach, there are a few things to be aware of. First of the benefits of involving oneself in the experience and being more present with objects and participants, it is somewhat in a lower amount than if one would fully participate in the observation (Aagaard & Matthiesen, 2016). However discrete one wants to be, it is unavoidable that the participants will not start to interact with the researchers, who try to stay in the background. Additionally, one runs the risk of having to let potential observations pass when observing more than two participants simultaneously. It is likely that the two of them will do something worth observing at the same time, meaning that one has to choose which one is more interesting than the other (Cooper et al., 2004).

Taking notes while observing, might in many instances not be easy, one reason hinging on the observer's ability to multitask. Szulevicz (2015) describes in his chapter what it means to take good observation notes and how. The advantages of not taking notes are

that it gives the observer more freedom and better opportunities for a more natural participation in the practices; however, we intended to be non-participatory observers because we wanted to write notes while observing. Which also makes the notes closer to our memories of the observations. When using field notes, it is valuable to use an observation sheet to separate various parts of a study and formulate overall wanted information. Ideally, the wanted information would be divided in "each information seeking event" (Cooper et al., 2004, p.7). It is also recommended to give each topic plenty of space for 'other information', that do not necessarily fit into the given categories (Cooper et al., 2004).

One way the observer can prepare for the observation is to look into what kind of scenarios and instances or times that one should familiarise themselves with. It is then worth to the observer to note down what they think are relevant events and interactions. Here it is also a good idea to note down the things people are saying. One thing that is important, is to avoid writing down more generalisations and more characteristic observations, as they can be seen more for evaluations. It is also a good idea to try to describe concrete details about actions and discussions. Overall, the point is that when taking notes, the observer has to try to not analyse and give specific motives to the participants' actions. An example of this that Szulevicz gives in the text referred to above is, instead of writing that a person is mad, then describe how the participants are expressing themselves (Szulevicz, 2015).

Based on these above described texts, we are using the participatory observation method slightly differently and though we take principles from the video observation method, we do not use video. We drew inspiration from their advice on note taking, and on paying attention to our role as the observer, and so, we use what Cooper et Al. (2004) are describing as a non-participant observation, with a combination of interview as a way to both obtain verbal and non-verbal experiences from participants (Aagaard & Matthiesen, 2016).

4.3 Interview Method

As mentioned earlier, because the observation method is mainly used to see and record participants' behaviour, this led us to adding an interview method to gain additional data from our participants. The interview is one of, if not the most widely used method in qualitative research. It is a method that brings insight into people's lives, situations, attitudes, beliefs and lived experiences. There are many types of interviews, and fields such as journalism, politics, communication experts, doctors and therapists, and all use the interview differently. Therefore, it is important to point out how the research interview, which is part of the method we used in our study, differs from the above-mentioned fields and how and why we conducted an interview.

The method involves conducting open-ended, in-depth interviews with participants to gain insights into the interviewees' experiences, perceptions, and attitudes towards a particular phenomenon (Brinkmann & Tanggaard, 2015).

4.3.1 Semi-Structured interview

A semi-structured interview is a qualitative research method used in the social sciences. It is a type of interview that combines elements of structured and unstructured interviews. Unlike structured interviews, which follow a pre-determined set of questions, semi-structured interviews allow for flexibility and improvisation during the interview process. The interviewer has a general guide or outline of topics to cover but can also deviate from the script and follow the conversational flow. A semi-structured interview aims to gain in-depth, open-ended information while retaining some structure to ensure that specific topics are covered (Brinkmann & Tanggaard, 2015). We conducted one semi-structured interview combined with a focus group interview to allow for flexibility and let the participants build on each other's statements and discussion while maintaining a structure to ensure we covered our topic.

4.3.2 Focus Group Interview

The Focus Group Interview is an example of a variation of the interview method. The focus group interview is a conversation between multiple preselected participants where a facilitator is present to start the interview and guide the participants in certain directions (Brinkmann & Tanggaard, 2015).

In our study, we use the focus group interview to get multiple perspectives on a common theme. The themes we set are the MakersSpace 9220 as an experience space, the community the participants might enter, and the experience of being women in male-dominated fields such as STEM and Maker Communities. Depending on the participants, the focus group interview can lead to open discussions on these themes and possibly other themes that might emerge during the session. The addition of the semi-structured structure had the advantage of not letting the discussion diverge too far from our chosen topic.

Focus group interviews are suitable for gathering data from the group's social interactions and norms; however, this method is not suitable for achieving a deeper understanding of an individual's perspective. With this method, each participant has less time to talk than in an individual interview (Bloor et al., 2002).

For our take on the focus group interview, we, during the *taking action* phase of our research design, left space for the participants to discuss social norms and their experiences at Makerspace 9220, their professional life, i.e. studies, job etc., and their leisure time. The intention was to observe and note which norms became apparent during the interview and in their discussion (Cf. Section 2.3.3 Concepts of Norms and Scripts). We as facilitators asked questions based on our semi-structured interview guide and made sure to facilitate the conversation if it petered out. One reason we chose the focus group interview method was the advantage of participants asking questions and commenting, thereby keeping a discussion going and the possibility of gaining surprising insights and perspective on our problem area that might not have emerged in individual interviews.

One important thing to remember when making a focus group interview is the group dynamic. According to Bloor et al. (2001), it is important that the group is not too homogeneous, which in many cases is difficult to achieve. If the focus group is too homogeneous, there is a risk of making the data non-relevant and not varied. On the other hand, if the group is too heterogeneous one might risk a lot of conflicts where the participants cannot relate to each other and therefore do not have a common ground to talk from (Bloor et al. 2001, s.20).

Part of our approach to organising a focus group interview was inviting participants to participate in a workshop. The intended target group was women with education within IT because this segment might be likely to frequent makerspaces in the future. We contacted Prosa (PROSA, n.d.), a Danish union for IT professionals, because they have a women-only network in Aalborg, where members meet to widen their professional community. The intended effect of choosing this women-only network was the possibility of the women knowing of each other from networking events without being too familiar while still having shared foundations to discuss from. Our hope was that the group would not be too homogeneous or too heterogeneous. According to Bloor et al. (2001), having a focus group interview with participants within the same social network makes it easier for the participants to understand each other and be a part of the conversation due to the safety they feel while talking with others from the same field of work as themselves. With participants from the same social network, they know what kind of world they come from and can elaborate on what other participants say (Bloor et al. 2001). Here we should mention that we were unable to gain participants from this women-only network (Cf. Section 5.2 Workshop).

As facilitators, we had to decide how much we wanted to involve ourselves in the discussion. According to Brinkmann & Tanggaard (2015), there are three levels of involvement; one with a lesser degree of involvement with a few open questions at the beginning

of the session, a second with more involvement and specific questions and perhaps tasks for the group to solve. The third is a combination where the facilitators start with few open questions and in the end have several leading questions (Brinkmann & Tanggaard 2015, s. 142).

In our workshop, we chose to use the last level of involvement; participants had the opportunity to discuss what they found interesting in our predefined subject and their previous experiences. Moreover, it gave us more opportunities to ask them specific questions about their experience at Makerspace9220. The most important role of the facilitator is to ensure the environment for talking is open-minded, attentive, and flexible (Brinkmann & Tanggaard 2015, s. 143).

At the start of the focus group interview, it is beneficial to introduce the participants to the problem area (Brinkmann & Tanggaard, 2015). In our workshop, we aimed for an authentic experience. Therefore, we planned an exercise for the participants at Makerspace9220, which means that we would need an introduction to the problem area at the beginning of the focus group interview and not introduce it at the start of the workshop to not prime the participants. It might also be beneficial for the participants to take turns and briefly introduce themselves, even though some participants might know each other from prior engagements, to engage all participants individually and encourage them to be active in the discussions (Brinkmann & Tanggaard 2015, s. 144).

The data collected through this semi-structured focus group interview with five participants is very nuanced and covers many more and nuanced problems and topics than we expected, and has given us a tremendous amount of new information to analyse and extrapolate insights from for further exploration, which we do through the affinity diagram analysis method below.

4.4 Affinity Diagrams

After gathering all of the data, it is time to analyse everything. Here we chose to use the Affinity diagram as an analytical tool. The affinity diagram is used to simplify and organize data from fieldwork, where one arranges the data into groups and further uses those groups to reveal common themes and issues. We have more than seven different datasets, and it is one good method, among many, to use when there is a lot and different kinds of data that needs to be analysed. We have chosen to use this method as it is detailed and visually organises bits and pieces of data extrapolated from the datasets. The use of this method has taken inspiration from the text Contextual design – chapter 6 (Holtzblatt & Beyer, 2016). It is to say that some of the things that they recommend doing, we have chosen to do differently or to leave out, as it is not as relevant for our project; however, we adhere to the main procedure they suggest.

In their text they lay out the different steps for creating a good Affinity diagram, where it is recommended first to code all the data; all the data is looked through by the whole group. It is then recommended to write down all those coding on what they call affinity notes/or yellow notes. The process is somewhat divided into four different parts and four different coloured notes: Yellow, Blue, Pink and Green (Holtzblatt & Beyer, 2016).

As mentioned already, the very first part of building the affinity diagram is interpreting all the data and coding. This means that the group is going through all the data separately, assigning each of them with appropriate User codes. Each note is given a user code, to separate the different data gathering, such as having different interviews and observations. If there is more than one interview, e.g., having done four different interviews, they will then be numbered into I01- I04. Besides the user code, each note will also be given a note number. Each of the notes are then supposed to consist of one aspect and is chosen for the reason of its relevance (Holtzblatt & Beyer, 2016).

After haven coded all the data into affinity notes, the text recommends printing out the notes onto yellow post-it notes. The reason to have all of the affinity notes printed out on paper is recommended by the authors because this method is to be used when there are 500-1500 affinity notes, and it is according to them too much data to be immersed in on a screen which leads to not enough team interaction to achieve a high-quality result. Though they do state that if one day it is possible to digitalise walls all over a room, then it is likely that you can achieve the same result without the use of paper (Holtzblatt & Beyer, 2016, p. 129). Inspite of this, we chose to use this method in a digital platform, due to practical reasons, such as having no access to a group room for a longer period of time.

When all the affinity notes have been printed out, the notes are mixed randomly and divided amongst the group. The amount of people depends on the number of notes, here they recommend asking more people to join if your team is small. This is though only a recommendation; it all depends on what outcome the team wants to achieve with the affinity diagram. When the yellow notes have been divided, it is time to start building the affinity diagram. The diagram is built bottom up, which means that it does not start with naming categories and overall themes, but it starts with firstly, taking each note and placing them on the wall. Here one person can start by placing a yellow note on the wall, where the other team members then can look through their notes and start grouping similar notes together. This keeps going on until there are no notes left. To begin with there is no need for anyone to justify why they are placing the notes. At this stage it is recommended to have a low number of notes grouped together and a higher number of groups (Holtzblatt & Beyer, 2016).

After haven put up all the affinity notes, it is then time for the Blue labels. These labels are the next step for categorising the formed groups. Here the team will approach the different groups where the team will come to an agreement for the sorting of the group. Here each group must be looked through and search for meanings and key ideas that link them together, where a blue label will be made with a phrase that can summarise the

content of the group. A way to make a good group label is to write it in more direct and immediate language. Moreover, a good blue label includes each aspect of the underlying yellow labels (Holtzblatt & Beyer, 2016).

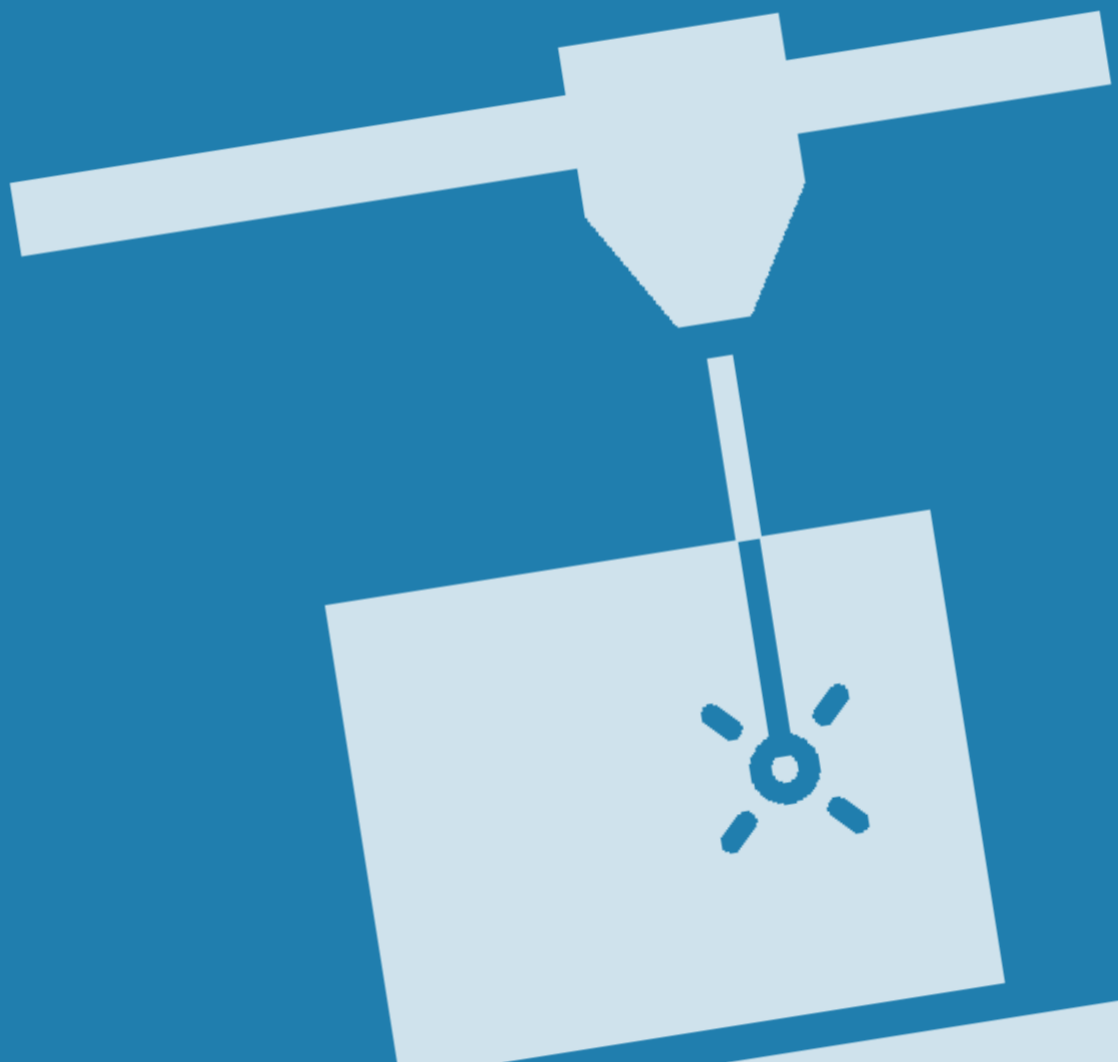
When all of the groups have been labelled with a blue label, those groupings can now further be sorted underneath Pink labels. This labelling is meant to group each of the separate groupings into a group that gathers more into covering a larger area under the pink label. The pink labels are written in the same way as the blue, in one sentence, in the voice of the user (Holtzblatt & Beyer, 2016).

The last kind of label is the Green labels. They are used at the end to organize the sections further and shows an overall theme or story for all the underlying sections. The green labels are a way to lead the reader through all of the data and to give a quick overview of all of the outcome. They are compared to the pink and blue label not needed to be written in the voice of the user but can be written to give the underlying sections a theme (Holtzblatt & Beyer, 2016). By using this data analysis method, it gives the reader and the designers a better overview of all the gathered data. Moreover, it is a great tool to organise all the findings into separate groups, that is then easier to analyse and to easily see the important aspects that stand out.

4.5 Part Conclusion

To conclude this chapter, we have described and explained our overall research design and the various methodological approaches used. Though these methods seem separate they all tie together in a unified design and have led us through the various stages of this research and thesis. In the following chapter, we utilise the methods explained above and apply them to various cases and data gathering sessions we have chosen to conduct. Our research participants, the two cases we have applied the Experience Matrix on, how we prepared, organised and conducted our workshop, and more are all provided in Chapter 5. Our Study.

5. Our Study



5. Our Study

This chapter presents a comprehensive exploration of our research journey that was designed to delve deeper into the dynamics of creative spaces such as MakerSpace 9220 and the experiences they facilitate. It comprises a methodical study of two distinct environments; MakerSpace 9220, a makerspace fostering technical creativity, and a café environment called Art By Me, which specialises in nurturing non-technological creativity through painting ceramics. To enrich our understanding and draw detailed inferences, we employed rigorous analytical frameworks, including Hird & Kvistgaard's (2010) Experience Matrice analysis method and Pine & Gilmore's (2011) THEME analysis.

Our investigation began with an experience matrices analysis of MakerSpace 9220, following each step of Hird & Kvistgaard's method. This process brought forth several dichotomies, reflecting a space that was simultaneously inviting and uninviting, efficient yet messy, essentially making it a fascinating subject for our study. It was not just the place, but the paradox it represents that allowed us to gain unique insights into the complex dynamics of makerspaces.

Subsequently, our attention shifted to the analysis of a café, an environment nurturing creativity in a decidedly different, non-technological manner. Leveraging the same analytical frameworks, we examined how the café embraces principles such as a warm customer welcome, an inviting interior design with vibrant displays, and showcasing of creative artefacts. These elements created a nurturing atmosphere, stimulating creativity amongst its users in a manner that is strikingly distinct from MakerSpace 9220.

In addition to these experience room focused analysis, we conducted an experiential workshop at MakerSpace 9220, involving a group of five women participants. The work-

shop was methodically structured, beginning with demographic data gathering, followed by a tour of the facilities, engaging in a hands-on makerspace activity, a reflection question session, and culminating in a focus group interview.

The final part of our study involved a close observation of our workshop participants. For this purpose, we developed an observation sheet that guided our focus towards the behavioural aspects of participants during the activity. We then used these observations to further our understanding of the experience of the visitors to the creative space, that is MakerSpace 9220.

In the following sections, we will delve into the specifics of these investigations, unravelling the intricate relationship between the physical environment, its inhabitants, and the creativity it fosters.

5.1 Experience Matrices & T-H-E-M-E

We wanted to analyse MakerSpace 9220 and Art By Me, to discover, explore, describe, and understand the spaces, therefore we choose Hird & Kvistgaard's (2010) experience matrice analysis method because the method. We initially thought that we would do a makeover in the room, making the place more inviting and clear up the mess and confusing things we found in the room. Experience matrice is hands on, describing which elements there is in the room and which elements we wishes is in the room. The method also made us grade the rooms different aspects, including the senses that is used when experiencing. We also use Pine and Gilmore's (2011) THEME analysis, as they look at the space from a different angle, where thematic is central for the analysis. We used both methods to get a nuanced picture of the space.

We did the same analysis on both MakerSpace 9220 and Art By Me, to compare two creative spaces extrapolate the good and bad principles, compare these, and take these into consideration in our discussion and proposal.

5.1.1 MakerSpace 9220

To grain a deeper insight into how users, particularly women, experience MakerSpace 9220, we used the experience matrices by Hird and Kvistgaard (2010). We did this part individually, since one of the group members know of MakerSpace 9220, and comes there often, that one might have some previous assumptions regarding the space. Whereas the two other group members had no assumptions of the space. All of our worksheet, for this section, can be found in Appendix D.

We went to Trekanten to visit MakerSpace 9220 an afternoon outside opening hours. In that way we walk around exploring the place without any disruptions. In beforehand we did a worksheet with the questions on from experience matrices, we had printed out an copy each and then walked around in science and filled out the questions. In beforehand we did a worksheet with the questions on from experience matrices, we had printed out a copy each and then walked around in science and filled out the questions. In that way we did not interrupt each other and our different experiences and thoughts. Doing the experience matrices, we also took some pictures at the place, so that we could use them if we got unsure of how thing was or other.

From the first matrix, describing the characteristic of the experience room we got answers like, sawdust, workshop, machines, cosy sofa area, organized, unmanageable, uninspiring and a mix between raw, white, and metal. All things that characterize and describes MakerSpace 9220 (See Appendix A for pictures of MakerSpace 9220).

Figure 10 Picture collage of MakerSpace 9220 (Own Pictures)

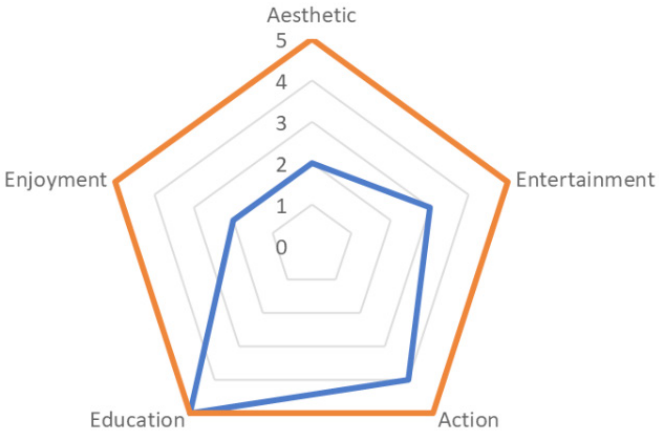


Figure 11 Graded graph displaying the five types of experiences (Own Picture)

From the second matrix one must describe the five types of experiences in the room, aesthetic, entertainment, action, education, and enjoyment, and grade them on a scale from zero to five. In 'Aesthetic' we each graded them the following: one, one and two along with the comments organised machines, raw, white and light wood, rustic wood elements are a plus, colours are a negative and the presentation of the room is messy. In 'Entertainment' we each graded them the following: two, three and three and comments many fun machines that you don't know how to use, many options and funny posters. In 'Action' we each graded them the following: three, two and four along with the comments "how does this feel when it is in use?" and much to grip, a lot can be moved due to the large movable elements and furniture, but since we visited MakerSpace 9220 out of opening hours, there was no other people than us in the space, and therefore not that much action. In 'Education' we each graded them the following: three, one and five. This one got score in every end of the scale, the comments from the high score were much potential, a lot to learn and intimidating, while the comments from the middle score were a lot you can learn, but it is a bit intimidating and the comments from the lowest score where you must seek out learning yourself, but there is potential. All the group members agrees that there is potential, but that the user has to seek it out themselves. The last type of experience was enjoyment we each graded them the following: one, one and one. The group members agreed that there is a lack of enjoyment in the room, but that it might be better if one knew

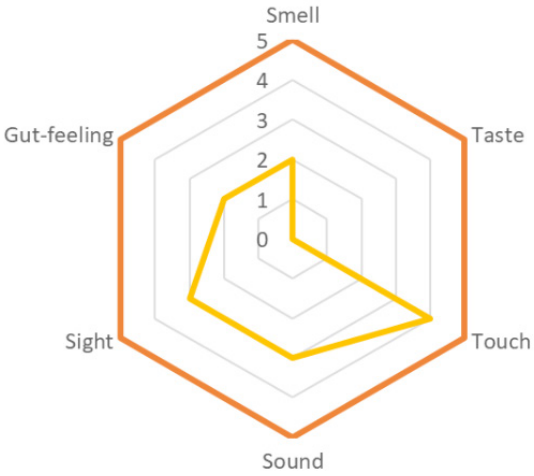


Figure 12 Graded graph displaying the six senses (Own Picture)

how to use the machines and if one had a creative purpose to visit MakerSpace 9220. The third matrix is about describing the six senses, smell, taste, touch, sound, sight, and the gut-feeling, in the room. The 'sense of smell' we each graded the following: two, two and two because of the smell of sawdust, enclosed, cold air smell and wood. Right now, when there is no one working with the machines there is not much smell in the room, but we imagine that when people are working, especially with plastic, the smell would be much worse. The 'sense of taste' we each graded the following: one, one and zero, since there is not really something for the sense of taste in MakerSpace 9220. The 'sense of touch' we each graded the following: two, two and four. The high score come from the comments cold, rough surfaced and pleasant/unpleasant, while the two low scores come from you want to touch a lot of different things. The 'sense of sound' we each graded the following: one, one and three due to the few noises that came from one 3D printer that was working and some mouse clicking. Again, the sounds would be more noticeable and higher if we did the analysis inside opening hours. The 'sense of sight' we each graded the following: two, three and two, because of the well-lit working areas, the neat and orderly shelfs, a lot of space to work in, but on the other hand the seats is non-inviting, the machines is non-inviting, the chaos and the too many inputs. There are a lot of things that stimulate one's 'sense of sight', in both a good and bad way. The last sense, the 'gut-feeling' we each graded the following: two, 1,5 and one because of the confused, messy,

overwhelming, uncertain feelings, but on the other hand also the inspiring, interesting, pleasant and well-known feelings the group members felt.

The fourth matrix is about the stories in the experience room, both the 'actual stories', the indirectly stories and the stories one wishes to hear in the experience room. The 'actual stories' being signs with prices, a lot of tools and machines, stickers, posters, instructions and the willy-nilly interior. The 'indirect stories' being that one can make new and creative things there, but that it is difficult to know where and with what to start with. The 'indirect stories' also being the small amount of inspiration one can find in the room. The room is a place where it is okay to be a little messy, where they do not care about the décor but there is a pleasant atmosphere. The stories the group wishes to hear was that the inspiration pieces could be clearer to know which machine they are made on, and how to make them. But also, more creative encouragement and more purity of style to change the mismatch there is going on in MakerSpace 9220.

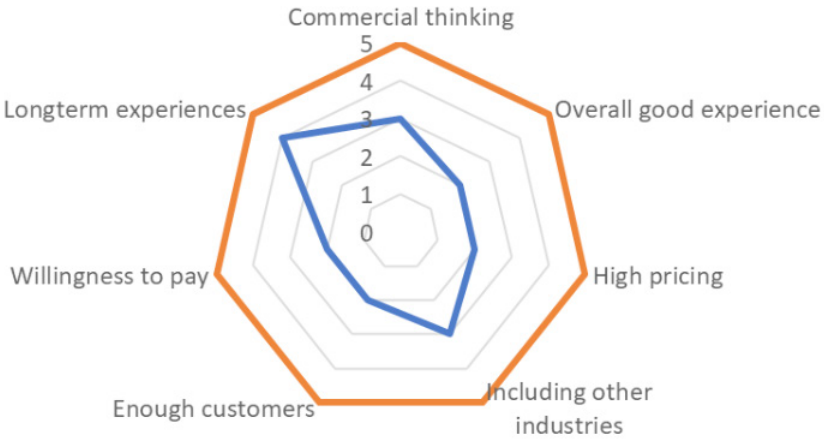


Figure 13 Graded graph displaying the economic potential (Own Picture)

The last matrix concerning the economic potential of MakerSpace 9220 regarding the 'commercial thinking', 'overall good experience', 'high pricing', 'including other industries', 'enough customers', 'willingness to pay' and 'long-term experiences'. Some of these questions where a bit difficult to answer for two of the group members, due to the little knowledge of Trekanten, MakerSpace 9220 and the way they run their business. Therefore, after we did the experience matrices we sat down together and compared our answers and score and therefor is there only one grade in each of them, the grade we

figured out together. ‘Commercial thinking’ got the score two, because one can find price lists in the room, but it is not particularly expensive to make things there. The ‘overall good experience’ got the score two, due to the mess and confusing there is in the room. The high price got the score two, the price is high if someone wants to rent the room, or if someone have big projects. But in general, the price is quite low, due to the fact that neither MakerSpace 9220 nor Trekanten is earning money on the materials. The ‘including other industries’ got the score three, due to fact that Makerspace collaborates with schools in the neighbourhoods. Also, because artists and small companies rent the space now and then. The factor ‘enough customers’ got the score one, due to the fact that MakerSpace 9220 wishes more customers and superusers to visit them. The ‘willingness to pay’ got the score two because it differs from customer to customer, depending on their economic situation and the project they want to make and how much money they want to spend on it. The ‘long-term experience’ got the score four because we all think this kind of experience is long term and not just a phase of trend, i.e makerspaces have been here for some time and will not just disappear again.

When we compared our notes, we also found out that we missed some data regarding the best and the worst principles and the theme of the experience. We also wanted to find the theme of the experience, according to 7. methodology, Pine and Gilmore (2011) says that every experience has a theme, weather it is intentional or not. Therefor we added the method T-H-E-M-E, by together discussing the parameters in this method.

The three words we agreed on at the first part was overwhelming, inspiring and ambiguous. Overwhelming due to the number of options, the aesthetic overwhelming interior and that there is a lot of small and big things in the room that the users have made there. Inspiring due to all of the things that one wants to explore and make in the room. Ambiguous due to the fact that the space is ambiguous, understood in the sense that there is room for creative freedom and freedom to both take care of oneself and to get help. This makes the space both easy and confusing.

In E, what elements should be eliminated because they form negative cues, we answered with the slightly clinical impressions of white and very light wood ones sees in the interior and the walls, the stickers there is places all over the room, which makes the place seem a bit sloppy, the mishmash in the interior where there is a lot of different styles in the room, eliminate the large table in the middle and spread out the tables and machines along the walls and also eliminate the uncertainty about where to do what that the users might feel.

The M, that sands for mix in memorabilia, we focus on the possibility to give out business card or tokens. There is not that big a need for memorabilia due since ones get the things, they are making with them home.

The last E, engage all five senses, the senses in MakerSpace 9220 was described during the experience matrices matrix three. The senses we would like to improve comes from the gut feeling and being overwhelming and confusing.

5.1.2 Art By Me

We wanted to analyse a place we knew is known for their creativity and welcoming atmosphere, to have a look at how they do it and if there were any principles, we can use in MakerSpace 9220. The choice ended up being Art By Me, since they, like makerspaces, describes themselves as a diverse space where everyone is welcome, the paradox is though, that we see many of their guests being women. By analysing Art By Me, we therefore would be able to see the other side of diversity section, where the men are the minority part within a place we see as feminine. We also choose Art By Me because it is a creative space where they do not use digital fabrication tools and therefore can be seen as dissimilar to MakerSpace 9220. All of our worksheet, for this section, can be found in Appendix E.

Art By Me is a creative ceramics café with a café in Aalborg that opened in 2017 (Om Os | Art by Me, 2023). The way the café works is that their guest book a table beforehand, where you have the table in 2,5 hours. When the guest arrives, they are welcomed by the smiling and welcoming staff, that shows them to their table. When all the guests have arrived, there is a brief introduction where a lot of information is delivered by the staff. The information is both how many layers of painting, different techniques and how to buy the ceramics and what is included in the price. The introduction is being hold at the place they call the colour bar, a display with all the different colours in colour order and with the paint displayed so the guest can see the colours after the burning. After the introduction the guest go to the ceramic shelf display and find the ceramic they want to paint. The price is different depending on which ceramic one chooses, included in the price is paint, different items for the different techniques and the burning of the ceramic. Then the guest has approximately two hours to paint their ceramic and when they are finished, they give their ceramic to the staff. The guest then has to wait around ten days before they can pick up their burned ceramic.

In their own words, Art By Me is a creative café that aims to create a cozy and creative setting that can give their guests a break from stress and hustle from their everyday life. They describe the cafe as a place where everyone can join, regardless of age, gender, profession and creative talents, because creativity comes in all shapes, sizes and packages. They have a saying from Pippi Longstocking "I've never tried that before, so I can definitely do it" that they feel fits perfectly with the atmosphere they strive to have in their café (Om Os | Art by Me, 2023).

We did the analysis by booking a table like an ordinary customer and went there for 2,5 hours. After we finished painting the ceramic, we sat down discussing the questions from our worksheet. We therefor filled out the worksheet together, agreeing what we noticed. This entailed that the score rarely was in the high or low end of the spectre, if not all of

the group members agreed. But by doing it together, it become more of a discussion than if we did it individually and some of the aspect that not all of the group members knew of due to little acquaintance to Art By Me could be cleared out. We main reasons we chose Art By Me to do a comparison analysis is their openness to all kind of people, regardless of age and gender, and because it is a popular creative space in Aalborg. We also did the comparison analysis to take a look at how Art By Me welcomes their guests and gets them started with their creative work regardless their level of creative skill. The way the hostesses welcome the guest and guide them through the different steps and techniques that can be used on the ceramic.

The first matrix, what characterise the room, got the words, bright, open, decorated with ceramics, organised, sections, private sphere, friendly and welcoming. All of these words describe the characteristic of Art By Me.

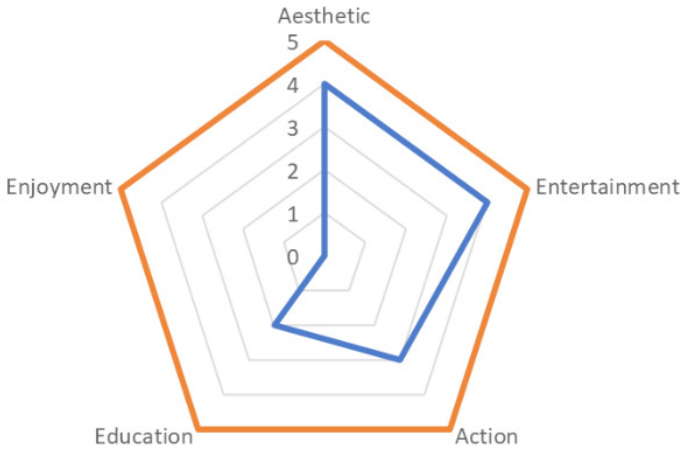


Figure 14 Graded graph displaying the five types of experiences (Own Picture)

The second matrix, describe the five types of experiences in the room, aesthetic, entertainment, action, education and enjoyment. Since we did the experience matrice for Art By Me together, there will only be one grade for every factor. The first 'aesthetic' we graded four, because of the bright, stylish and distinctly feminine interior and the decorative and inspiring that surrounds one. We graded 'Entertainment' four because time

flew when we were there, and we all felt entertained, even though one of us felt stressed about being in the zone but did not have enough time. We graded 'Action' three because it was quite relaxed and not that action packed but we almost never laid down the pencil. We graded 'education' two because at the introduction there was a lot of information in a little time of period, and the hostesses gave a lot of tips for different techniques, but they were difficult to remember while one was painting. We thought it would be better with some visual information, e.g., in a brochure or inspiration booklet, but we liked their introduction and think there are elements that could benefit MakerSpace 9220. The last one, 'Enjoyment', we graded four because there is a lot of great enjoyment visiting Art By Me and it was easy for us to enter a paratelic state while painting ceramics. Art By Me is good at helping the guest if needed and they are great at having different techniques, that is suited for different levels of creativity, so that everyone of their guest can bring home a beautiful ceramic. One downside in 'Enjoyment' is that there is a lot of choices, almost to many choices (See Appendix E).

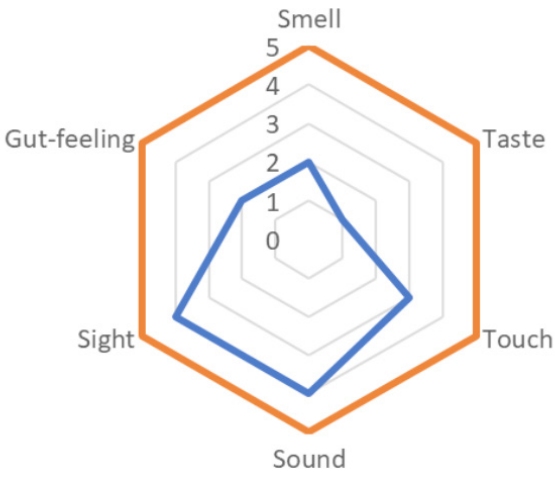


Figure 15 Graded graph displaying the six senses (Own Picture)

The third matrix is about describing the six senses in the experience room. The first sense, smell, we graded two because of the ceramic, painting and dust smell. There is not a lot of smell in the room, but the little there is, is not that pleasant. The second sense, taste, we graded one. There is a possibility to buy snack and something to drink, but we did

not do that. We noticed that the ceramic dust in the air made one a little dry in the mouth and thirsty. Er graded the third sense touch three because there is a lot of tactile surfaces to touch and if one uses a sponge to paint with, one touches the ceramic and paint more than if one is painting with a brush. We graded the fourth sense sound four because there is music paying in the background. Some of us found it distracting and think it would be better with only instrumental music, while others found it nice and relaxing. We graded the fifth sense sight four, because there is a lot for the eyes to look at, there is a lot of ceramic exhibited around in the room, there is a lot of different colours and in general a lot of things happens in the room. The last sense, the gut-feeling we graded four, for one of the group members it fluctuates a lot, but in general the space is fun, cosy, welcoming and there is a vibe of pleasant concentration. Overall, we agree that it is a fun and welcoming place, and that it is rare that we completely forget about the time for two and a half hours (See Appendix E).

The fourth matrix, description of the stories in the experience room. The 'actual stories' we describe as small cards with tips, menu on the tables, exhibition of painted ceramics, brushes and other tools, display shelf with different types of ceramics with price and numbers, introduction by the hostesses and QR codes with videos to the different techniques. The 'perceive stories' in the room we noticed was mugs with hot chocolate in mugs painted in the café, the furniture being recycled and that one has to book an appointment and therefor is there in no overbooking which makes it pleasant. The stories we wish to hear in the experience room was that we wanted a more direct display of how to use the various tools, they have QR codes to videos on their webpages, but it takes too lang time to use them, therefor we think that visual booklets placed at the tables would be a better option, so the guest could use them while painting (See appendix E).

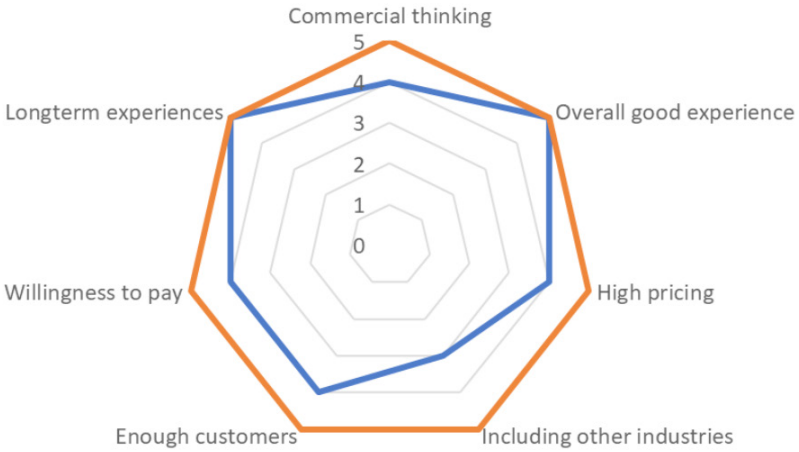


Figure 16 Graded graph displaying the economic potential (Own Picture)

The fifth matrix, the economic potential of the experience room regarding 'commercial thinking', 'overall good experience', 'high pricing', 'including other industries', 'enough customers', 'willingness to pay' and 'long term experiences' is all commented from our knowledge of Art By Me by the time we were visiting them. To fill out this part more exact we could have had a talk with them about their company and what they are doing, we wrote an email to them, but due to a nearby opening of a new department in Horses, they did not have time to talk with us. We graded the 'commercial thinking' four, it is a really good concept they have made, but it can be a bit difficult to understand what is included in the price due to the different elements, the ceramic, the paint, booking the table and the burning of the ceramic. We graded 'overall good experience' five, because we found minimal changes to their concept, and the small changes we found does not ruin the experience in any way. We graded the 'high pricing' four because the price is fair, a little expensive, but the prices vary depending on how big or small ceramic one chooses to paint on. We graded 'including other industries' three because we see them different places like in shopping malls, festivals and so on, but also because they have events at their café, and they have home packages where one can buy ceramic and paint to use at home. We think there could be a possibility to make an addon to the experience, where the guests can make their own ceramics, get that burned, come again later and paint it and get that burned a final time. We graded the 'enough customers' four because it is in

general a popular place. The ‘long term experience’ we graded five because it is a great concept and we do not see it as a concept that would die out, if they keep stay up to date (See appendix E).

We also did the T-H-E-M-E analysis at Art By Me. The first letter T got the three words creative, cosiness and poignant. Creative because of the colours and the colour bar that is inspirational and because of the examples of painted ceramic one sees in the room. Cosiness because of the welcoming, calm, helpful and therapeutic atmosphere, but also because of the personal space one gets by having their own table that do not stand too close to the other places. Poignant because the time flew, and everyone can become concentrated in their own way, and one is attached to the ceramic one is painting and wanted to finish painting (See Appendix E).

In E, what elements should be eliminated because they form negative cues, we discussed that the time limits one because the café needs to clear up after one group of guests before the next group comes. An element to eliminate is also the mishmash that there is kind of a lack of instructions but, at the same time, a lot of information at the beginning by the hostesses (See appendix E).

The M stands for ‘mix in memorabilia’, which is kind of their main concept. The guest comes there to paint ceramics they can get with them home. The last E, engage all five senses, is described in matrix three, and we do not see any improvements or increasing of senses that would make sense in Art By Me.

The atmosphere at Art By Me where also an important factor to look into for us, and we found that they have a nice and welcoming atmosphere. We also wanted to look into how Art By Me helps with the education of how to use the different techniques they suggest the guest can use if they don’t want to paint free hand and they have some options where

one can scan an QR code and see their videos at their website and the guest can also ask the hostess if they need help or guidance. The introduction they gave when we visited them, was also inspirational for us, and from the visit, we can take elements like how they greet people and ask if they have been here before, and how they are introducing themselves and the space. Elements that we can take with us in our work with MakerSpace 9220. The last factor we wanted to look into was how Art By Me display their inspirational ceramics, and they display their ceramic in windows and on shelfs, but they are also very good at using their ceramics when one buys something to eat or drink, but also on their nametag and even lamps.

One important thing we did not experience at our visit at Art By Me, but a thing we become clear of later, is their Instagram profile. They are good at showing the ceramic their guests paint and show examples of how to use their different techniques. Their Instagram profile is one big inspirational booklet which we find very interesting in useful for their guests.

This first field research led to new insights, where Art By Me had many good principles for us to develop best practices from. Moreover, MakerSpace 9220 seemed filled with disparate and sometimes conflicting elements and intentions. In our initial inspection of the space, the intended use of the space seemed unclear, and there was an uncertainty surrounding the approach to the space and the machines. To confirm whether this observation is a general issue, or something experiences only by a few participants, we intend to gain further perspectives of the space by inviting women from IT fields to a workshop at MakerSpace 9220.

5.2 Workshop at MakerSpace 9220

When looking into the different related literature, some of the things that stood out to us and made us want to explore further was the number of women in the STEM fields, and how many women related to the STEM fields knew about the maker movement (See Section 2.2.2 Women in Makerspaces and DIY Communities). This was to get an overview of the makerspace and see if and how other women experienced makerspaces. We began furthering our research by contacting several women-based or women-related organisations in STEM or other male-dominated fields, such as construction work and craftsmanship companies. These included Boss Ladies, a Copenhagen-based corporation working towards changing stereotypes and creating a culture change in the technical and construction fields (BOSS-LADIES, n.d.). We also contacted Kvindesmedien, a company that started as all-women smiths. Smithing is a field that, similar to the STEM fields, lacks women, which is why they were interesting to us as a possible source of insights on their experiences on being a woman in a male-dominated field. Lastly, we contacted Prosa, a union for IT-related jobs with a branch in Aalborg. More specifically, we reached out to a sub-group within the Prosa Union, an initiative called Prosa Women Network. The intention was to get an interview with their group members or the people who organise events and initiatives within the group.

While we were trying to make contact to all these separate corporations, we were simultaneously working on how to gather insights into experiences at MakerSpace 9220. With this, we found that the most effective way to get data was to plan a workshop in MakerSpace 9220 with participants and observe their behaviour. We wanted to see the participants' reactions to being in and using the MakerSpace 9220. There were some aspects of the workshop that we needed to plan to gain a certain quality of the data outcome. Therefore, we first investigated which methods could be helpful for us to use, and then we started to plan what we wanted out of the study and which additional insights to gain. With our problem area, outlined in Section 1.2 Problem Area, it is clear that we needed to

find women users to participate in our workshop, more specifically, women that have a relation to or knowledge of the STEM fields, and have some form of professional experience in related fields, providing different perspectives of how they view the problem we outlined. Therefore, we contacted the Prosa Union Women Network group to ask if some of their group members could join our workshop. We made contact with the organiser from their Aalborg branch, who was very helpful. Besides the fact that we made an open call post on their Facebook group page, we unfortunately only got one woman to sign-up for our workshop, and she was unable to join in the end.

Therefore, with little to no time left to gather participants, as we already had agreed with Trekanten on a date and time, we needed to find alternative participants. Here we got a hold of some women that some of us knew beforehand. Due to privacy, we have chosen to limit the participants' personal information and they will therefore be known as the participants, participant or P1-5 in this report. It was important to note that a number of the participants had prior social connections with one another or with the research team, which may have influenced the outcome of our data. This could have created a familiarity bias among the participants and possibly influenced their responses and behaviour.

When planning the workshop, we initially wanted to do a video observation, but as we looked more into that, we found that it was not the best-suited method for us. Mainly because we found that regular observation was more beneficial, as it would require us to be more involved while observing. Even though we still wanted to be non-participatory observers and not fully include ourselves in activities like participatory observers. We focused on observing but still indulged ourselves in the atmosphere (See Section 2.3.2 Concepts of Atmosphere). Looking into how we could observe the participants in a way that we gain the specific data we were looking for, we created an observation sheet (See section 4.2 Observation Method) which helped us plan out what kind of data we wanted to gain. First, we separated the observation into different parts of the workshop (see Figure xx).

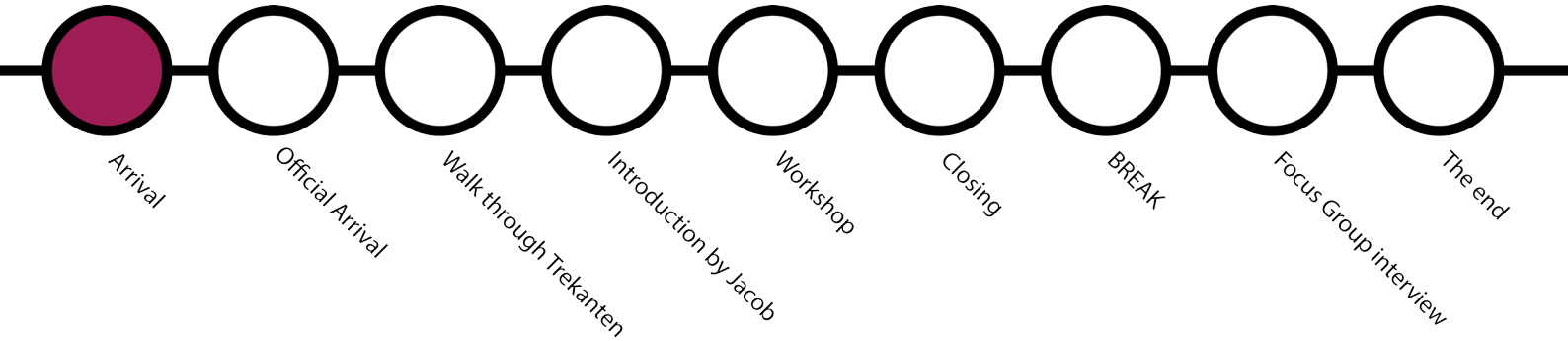


Figure 17 Workshop timeline (Own Picture)

We separated the workshop into parts that we found particularly important to observe. Afterwards, we identified the relevant sections that we needed to be observant towards during that workshop phase. To figure out the timing and planning of the workshop, we explained the scheme more in-depth (See Appendix F). These were both used for us, but we also created a simpler version for the participants, so they could gain better insight into what was planned for the workshop. We divided the time plan into a schematic overview of the nine sections being one axis of the different parts of the workshop, and the other axis was divided into three sections; how we introduce the next section, what activity and how it will play out, and the last part the Closing of that specific section (See Appendix F). This would help us so that we all had a very good idea of what would happen, who had what assignments, and how much time should be allotted for each activity.

The workshop was, as mentioned, divided into nine parts, the first being the "Arrival" of the participants, where we would welcome them, offer them some coffee or tea, and give the participants time to settle in before starting. When people had settled in, we would then briefly introduce who we are and give them information about what would happen, which we named the Official Arrival. Before continuing to the next phase, we asked them to fill out a short demographic questionnaire, which we describe later in this report.

When the formalities were over, we gave the participants a tour of Trekanten, and at the end of this tour, they arrived at MakerSpace 9220. We did this to also observe their reac-

tions to travelling down to the makerspace and if they noticed something that could affect some of their opinions on the makerspace placement, and to get their whole experience from start to finish. This whole first part would be led by one of the group members and then the two others would be observing.

We had made an agreement with the makerspace employee, who usually coordinates things in MakerSpace 9220 (Cf. Chapter 7. Discussion for further description of WF). To make the experience as authentic as possible, by having a person who usually leads and helps the users in the space, to be the one who facilitated this workshop. The employee who helped us with the workshop will henceforth be referred to as the Workshop Facilitator (WF). We also planned not to have any other people in the space, holding the workshop outside the regular opening hours. Given that we were only three group members to observe and having other people in the space, they might be distracting for the participants or us, the facilitators. The WF planned to start with an introduction to MakerSpace 9220 and the machines.

Before the workshop, we had a meeting with the WF about what the most beneficial activity for the participants would be and for them to get an appetiser of how it usually would be to visit MakerSpace 9220. Here the WF had planned for the participants to perform two different activities on two different machines. The first activity was the laser cutter, which included the participants using a program on a computer to create some nametags that they would then have to transfer over to the laser cutter machine. The second activity consists of the participants trying the folio cutter machine that can cut folio in patterns or letters and then get them to transfer it over to a cup. With both activities chosen, we had not given any instructions to the WF about how he was supposed to facilitate; the only requirements we had were for him to do it in a way that he would normally facilitate.

After the activities were finished, we then planned to give the participants a short break to have some time to relax. Before the break, we wanted to ask them to answer one reflective question; "Describe your first impressions about the activities and the makerspace?" (See Appendix G) This was meant as a short question that would prepare them for the focus group interview and also to get their initial thoughts on what they have experienced up until that point. During the break, we gave participants around 15 min to get some more to drink and served some cake they could enjoy. Moreover, we also planned that within this break, it would be a great opportunity for us to observe the participants in a more relaxed setting, in the hopes that they would further discuss their experience with each other while taking the break, and maybe we would observe other interesting activities. Sometimes knowing that one is being observed can cause people to behave unnaturally, but during a break it might seem a bit less, as they can think that no one is observing them.

The last part of the workshop was planned as a focus group interview to get other insights that might not have been observable during the other parts of the workshop. For this, we created a worksheet for the interview that is explained further later section in section 5.3 Focus Group Interview. In the following part of this, we focus on the intentions of the interview in relation to the workshop and the observation. The interview itself was intended to be a Semi-structured focus group interview, with the intention of asking the participants questions with the hopes of opening a more fluent conversation between the participants.

The interview was a way for us, as mentioned, to get an insight into the participants' reactions. Moreover, it was to hear their opinion on our problem area. We had intentionally not planned to give them the specifics of what we wanted to examine in the workshop. This was not to give them a prior opinion about the makerspace, which could potentially change how they behave and experience the activities. Therefore, we chose to give them

a full introduction to our project, our problem area and what their role in the workshop was intended to be at the beginning of the interview. We conducted the focus group interview as the last part of the Workshop.

When it came to the planning of the workshop, we had also planned some more practical aspects, such as the timing of the different activities, placement of the facilitators during every part, which of the participants had what roles and the chosen space for the different activities. First, the timing of the different activities, could of course only be proximate timings, but they were helpful for us to know when it would be natural to end an activity and also to be able to tell everyone that was included, how long the workshop would take and when they approximately would be done with the workshop. The placement of the facilitators was something that we found important, as it would be easier for us to know our roles while observing and minimising the possibility of missing observations. Therefore, we divided the areas into three sections, as seen in the photo, according to where we thought the participants would move. As for the time aspect, this was also approximate, as we of course are not sure where the participants will move and will therefore need to be flexible if needed. In case of a participant would move to a space that was not covered, then we would not have to stay in our designated area.

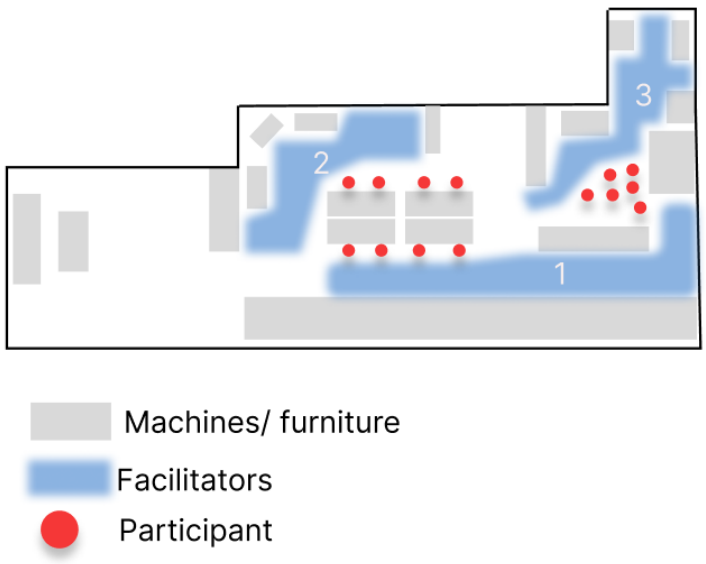


Figure 18 Layout of MakerSpace 9220 and designated observation areas (Own picture).

The last two mentioned plans we made are self-explanatory. In that way that we, of course, had to agree and plan on who said what during the workshop, who went to prepare for the interview, who was going to give the introduction to the participants and who was going to be the facilitator for the interview. Secondly, choosing the spaces that were going to be used during the workshop. Here some of the spaces were also self-explanatory, as we wanted to have the participants perform the activities in the makerspace, and we wanted to give them a tour of Trekanten. Other than that, we only had to plan out where we would meet with the participants and where the interview would be conducted. The meeting point was chosen in such a way that the participants who have not been to Trekanten before would be able to find it. Even though this was a bit tricky as Trekanten has multiple possibilities for entrances and we would not be able to predict which way they would come from. Therefore, we ended up having the meeting point in the café, located which is in the middle of the building. The interview was a separate discussion, and we chose to hold it in MakerSpace 9220, as we did not want to be disturbed by other people, but we also wanted to stay in the space of the activities, so the participants would be able to relate their explanations to the room itself, but also so they might be able to see things differently when discussing it with the group.

When it came to how we included our background research in the planning of the workshop and the observation, there were a few things that we took inspiration from and had in mind to utilise for the workshop. Firstly, we used the literature analysis as a starting point to what others have done before, specifically, what kind of research the other sources have used. This we did to see which of them worked and which of them we could learn from. In that way, we were able to utilise these insights into our project by taking their insights on the subject and asking ourselves: how can we take these new insights and either improve the method, use them for our research or see it from a different perspective to broaden the perspective on the subject? One example of one of their use methods was how the authors of "Sprinkling Diversity" (Smit & Fuchsberger, 2020) used the design

fiction method. As mentioned in Part II, this method provided several design fictions on the subject of women in makerspaces and discussed the matter in a workshop with seven women experts. We took inspiration from this project's outcome and used their insights to utilise our workshop.

Our research draws on several relevant theories to shape our observation sheet and focus group interview. Specifically, we have integrated experience theories in our observation sheet to be more observant of how we planned the experience and how they experienced it. As described in section 2.3.1 Concepts of Experience, an experience is not something that can be designed, but we can as designers, shape the conditions of an experience in such a way that we choose the place and the activity, so we know those factors. The main thing that we have no control over is how the participants experience the event. This is what we are observing and discussing with them. We can, with the help of the theories, figure out what things we can look for and plan what we are asking them, which in return, we can relate to our theories to see if any of our gathered data can fit into some of those boxes.

5.2.1 Observation sheet

When planning the workshop, we investigated what kind of observation sheet would best fit our workshop. Here as mentioned, we initially had in mind that we wanted to video record the workshops. However, with further investigation, it was found that a video observation was not the most optimal solution for us. GDPR, the amount of data video introduces, and how videos affect participant behaviour were all reasons we chose not to use video observations. Therefore, we reached out to our supervisor, who provided a template for observation sheet consisting of designated areas where short questions or descriptions are explained and boxes that one, as the observer, can fill out. This could, for example, be a box where the observer can write down relevant information about the participants, e.g. if they are late or not attending and if there are any other disturbances.

It also included parts where one could write about the participants' placement for sitting or standing, all to give the observer more guidelines to follow, so they would be pushed to look for specific things.

We related our observation sheet to this example and applied it to our workshop. We did this in such a way that we separated each of the different parts into the sections suited for the workshop's agenda. Then we looked through the example to see how we could adjust it to our use in a way where we would be pushed to see specific scenarios. For example, we had a very clear idea about wanting to observe the participants' attention during the workshop, and their relation to each other, the WF and us, in such a way that we created a section devoted to describing the relational structure, both indirect and direct. Here we asked the question: "How would one describe relationship structure and quality in the group within the following directions? Please note both - verbal and non-verbal cues and interactions, including mirroring, spatial movement, spatial positioning, proximity, touch, etc." Where we then made boxes to fill out with Participants and the main Facilitator / us, the participants and WF, singularly participant and participant and lastly, the participants. (See Appendix H for the observation sheets)

Taking inspiration from the observation method (See section 4.2 Observation Method) we had in mind taking good observation notes, here they (Raudaskoski, 2015) write that one way to prepare for an observation is preparing what kind of scenarios might happen and use those as guidelines, which we used in the observation sheet to frame our sheet. For instance, we imagined what key points of the workshop we wanted to observe and imagined that we would see the participants engage with the machines in some way where they would show some kind of emotions. Therefore, we included the relationship structure boxes in the section where we imagined the participants would interact with the machines (See Appendix H).

We used this in multiple sections, but for the activity section, we included another box in this category, which was the relationship structure between the participant and the machines. In that way we would be primed to look for their reactions and actions with the machines and whether they had any disturbances with them or if we could observe any form of self-efficacy. This was used to describe the relationship structure or how we described it in the observation sheet.

"How would you describe relationship structure and quality in the group within the following directions? Please note both - verbal and non-verbal cues and interactions, including Mirroring, spatial movement, spatial positioning, proximity, touch, etc. Do they seek help and from whom?" (See Appendix H).

For each of the different parts of the workshop, the questions and boxes were designed in such a way that they fit the specific time point of the workshop. Moreover, each section had an overview of the index and progress of the workshop, shown with a red dot on the specific section that one was at, e.g. the interview was very different and had bigger boxes related to the themes of the question guide. This was to help the observer not to get lost in all the sections, as a lot of them are very similar in what they are asking one to observe. Some of the things that were repeated in the observation sheet were the relationship structure, describing how participants are drawn (or not) together by accomplishing a given task and how the members are emotionally connected. Those were relevant in all the parts where we felt most of the action would occur, such as while they were introduced to the makerspace, during the activity and in the focus group interview.

When preparing for the workshop, we kept some rules or advice in mind while observing, which came from the observation methodology (See section 4.2 Observation Method). First of all, we were aware of writing down what people were saying. Additionally, we also tried to refrain from writing down any more analytical observations, such as their emotions. Instead, we tried to write down more descriptive actions that they were doing.

5.2.2 After the workshop

During the workshop, we, as mentioned, would observe the participants and interview them after. However, when it came to how we had executed the workshop, there were a few things that happened differently and afterwards, we gained some new insights into the whole experience. First of all, there we had, as mentioned earlier, planned on having some women from the Union Prosa network, but unfortunately, we only had one person that had signed up for the workshop, and that person did not show up on the day. Since we only had one from Prosa who signed up, we had asked some fellow students and other women we knew had a connection to the STEM field, which means that some of our data are somewhat affected by the fact that we knew them beforehand. We might consider that because we know them, they might feel more comfortable in the activities. Moreover, they will most likely feel more comfortable with each other and will be more likely to chat with each other. Out of all the participants, three knew each other beforehand, but the other two had no connections to any other participants besides knowing us.

The plan of the workshop, there were a few things that changed during the workshop. First, we had some participants who were a bit late, which meant that we chose to give the participants the questionnaire before giving them the introduction. Additionally, the planning of the activities had changed, which meant they were given different assignments to do. To begin with, the WF used very little time to introduce the space itself but instead used some time on introducing the assignment they were given. Here they were split into three groups, two groups of two, and one individual on their own. Firstly, he asked them to take a computer each, given by the MakerSpace 9220. Then he asked them to open a video that was going through using a program. In this program, they were going to make a file with their name on it and a picture that they would then be able to transfer to the laser cutter. But while they all started on the assignment, WF asked one participant (P2) to follow them to do an additional different task. WF showed P2 how to use the folio cutter, but instead of the planned task of transferring it over to a cup after cutting, they

showed how to use the machine while P2 was doing the same things on a separate, same kind of machine. While WF was showing the folio cutter to P2, he also had an eye on what the other two groups were doing. He helped them when they ran into problems or had any questions. When P2 was done with the folio cutter, WF invited one of the groups to receive instruction from P2, where she could teach and show them how to use the folio cutter. When each group tried the folio cutter, which was not an assignment that took very long, they returned to the other activity, the laser cutter program. The participants used varied times to make the sign, and both groups, with two members, worked together. This is something we will get more into in the analysis section. We talked with the facilitator about why he made this change in plans; it was a strategy to simulate how the community in makerspaces work where the users help other users and educate them on the different machines, and that it is not always the employee at work that is helping those who need help.

Though the initial plan was to have a small break after the activities, when the time with WF was up, he had to leave and asked if it was okay, which we agreed to because one of us is a superuser in MakerSpace 9220. This, though, meant that we ended up going 30 minutes overtime, cutting the break short and extending the time for the focus group interview. Furthermore, it meant that while one of us had to help the participants finish their activity, we had one less person to observe the participants. Which then became more of a participatory observation for one of the facilitators. The positive thing about this was that the participants were very eager to finish their projects, which again is something we will go further into in later parts of this report.

All in all, the planning of the workshop gave us multiple benefits, such as us as facilitators being able to get a better guideline to what to observe and what we needed to say and do to get the best outcome of data but still close enough to make alterations if needed. Though the worksheet might have given us a lot of benefits for guiding us, it did though

have some restrictions. First of all, some of the boxes were somewhat similar even though our intention with the question were different when reading them while observing, it was difficult to know the difference. Additionally, to that, given the time limit, we also found it a bit difficult to guide ourselves through each of the separate boxes, and some of us ended up giving up on the separated boxes and writing everything in the bigger boxes at the end. However, this might also be because of the limitation of space in the boxes. They were generally too small when there was a lot to be written down. In hindsight, we should have kept the observation sheet shorter and more compact, so it is easier to read while observing. As an observer, one does not want to keep track of what fits in what box, and one does not want to have to read and miss some of the important observations. Besides that, we worked around that problem and were good at adjusting to these issues while observing, mainly because we all knew that the most important thing was that we could write down the important observations.

5.3 Focus Group Interview

As mentioned in the previous section, we were planning to end the workshop with a focus group interview. This was a way for us to get further feedback on their experience in the space. By this, we chose to utilise a focus group interview, as we then could start an open-ended conversation on the subject that we are working on. We chose to use a focus group interview, rather than a normal interview, because the overall reasoning for our workshop was to see participants reactions to the space, to the facilitator and to each other. With this method of a group interview, we were aiming to gather not only answers on our questions, but also gain insight into the group's interaction and how they react. Additionally, we aim to start a social conversation about the themes and subjects we were showcasing for them. A thing to note here is that because we have gathered a group of participants, who have knowledge of each other beforehand the social aspect of them both being a bit more comfortable with each other, but also that they might restrain from saying specific things.

As mentioned in section 4.3.2 Focus Group Interview, the groups dynamic was something we had to take into account. As our group is very homogeneous, in the way that it only consisted of young women from the ages of 20-30, apart from one, who was older. This meant that the interview was in the risk of the data becoming not varied. Though this is relevant to notice, we can also maintain the idea that, as mentioned in the chapter 7, by having the participant being in the same kind of social network, they are more likely to be able to understand a level their opinions with each other. With this we are gaining one specific view on the subject, by mainly collecting data from women with an IT, design, crafting background. Moreover, those are as mentioned in chapter 2 Literature Review and Theory some of the users that are lacking representation in the makerspaces. This is our main interest in our research, and therefore the chosen users we are interested in observing and interviewing.

Taking this and 4.3.2 Focus Group Interview, into consideration, when planning the interview, we were wanted to introduce the problem area for the participant during the interview, wanting authenticity from the users during the practical exercise. By this we first of all gave them an introductory question, right after the activity, that would prime the participants for the upcoming interview. This question was mentioned in the prior section. More generally planning for the interview, we wanted a more open conversation, which lead us to creating a semi-structured interview, and only preparing some guiding questions. We chose to work with the aspects of the experience matrices, in such a way that base the question guide on the different steps of the experience matrices.

1. Characteristics
2. Types of experiences
3. Senses
4. Stories
5. Economic potential

With this the first part would be asking the participants to describe the characteristics and experiences of the room, by describing them and if there where anything special that they noticed when entering the room. With the senses we wanted to ask the participants about their gut feeling while being in the room. To not only get their impressions of the space itself but also to hear about how their initial experience was. Following that was the stories, which included things they noticed, such as signage, indirect guidance and whether what kind of information they were wishing were there. Lastly, we also included the economic potential in the form of their opinion of the price level. Which we included, as the price of things is a part of the experience, but that all-in all hopes of opening for conversations, that we might not have thought of. Additionally, these questions, were somewhat taken directly out of the method, which were in the hopes that we could relate their answers to our own initial insights of the room. Lastly for the experience matrices, we also included the T-H-E-M-E of the room, which in question was narrowed down to one question of what they would describe the room with an overall theme.

Besides using the experience matrices, as guide, we also took the theories of self-efficacy and, experience, as inspiration for some of the questions. These were all themed as activity questions. First of all, we wanted to gain some more insight and some of their opinions on their experience with the Workshop Facilitator. Moreover, we wanted to know whether there was anything about the activities that they found challenging. Seeing if there were any problems that they ran into during the activity, would help us see if there were any occurring problems with the activity and if they were caused by anything specific, this could help us see if it had affected their experience in some way. Lastly, we asked them to describe their overall confidence while performing the activities. This was mainly because we wanted to hear if there was any shown lack of self-efficacy in their progress, and in if it had affected the experience.

To try and push the problem area a bit more on their shoulders, we included a section of our questions, where we gave some small facts about how the STEM field and the makerspace is connected in more were than they might think. Here we mentioned that: In STEM education, there is a 30% female representation. In this specific Makerspace, there is a 32% female presence among regular visitors (See Appendix G). Here we would ask the participants their opinion on this matter, if they can relate in something in their lives and if that it is something that affects them. We did this with the hopes on starting an open conversation about our problem area in a more specific way. Lastly, we asked about their overall experience at Trekanten and if is a place they could see themselves visit later on. To make it more clear on our planned interview process, we only intended these questions as guidelines, which meant that we did not expect to get answers to all the questions. Process wise that meant, that we would use the questions as a starting point for the starting of the conversation, or when the conversation would somewhat find its natural ending. Given that we chose to record the interview, we had the chance of running into the possibility of the participants being more aware of the fact of them being recorded.

After the interview

After we had conducted the interview, we had some overall comments on how it went and what we gained and not gained from it. There were a few things that we noticed, which had a bigger effect on the outcome on our data. First and foremost, there were a significant difference in the participants engagement in the conversation. Some of the participants were actively giving more answers and generally longer answers for most of the questions. This did affect how the participants that might not be as present or forthgoing were left out of the conversation. Though this was a problem, our facilitator was good at directing some of the questions towards all the separate participants, in such a way that everyone was asked to answer. But as this might have been a good approach to engaging the participants, it could affect the answers in some way that they it would become a follow the leader kind of situation. In generally the interview went well, in terms of how the

participants were good at extending the conversation, beyond answering the questions. Due to using more time on the activity, it ended up using some time from the interview, and ended up cutting the interview short, which then meant that we had exclude some of the questions from the interview.

5.4 Questionnaires

Following the workshop and our experience matrices, we further wanted to get insight in the types of users of MakerSpace 9220. Therefore, we planned to send out a demographic questionnaire to the users that spend time there. With this we also had the intention of gaining further knowledge of the community in MakerSpace 9220, including their gender, age and occupation. The questionnaire was created using the Teams forms, as a tool to create an online questionnaire. With this we included a short introduction to the project and who we were. The demographics would give us further relation to who are normally using the space and if we can relate those statistics to what we had learned from our literature review. The intentions with the questionnaire where then so send it out to the users of the space, where with the help of Teams we could make the questionnaire and send it with a link or print out a QR code, that we then would lay around in MakerSpace 9220. Furthermore, we also gained access and permission to send a post out onto a designated Facebook group for users of MakerSpace 9220, which consists of both old and new users.

So, including our more qualitative data from the workshop, we would with this questionnaire gain some quantitative data, which we could analyse in the use for gaining a more demographic insight into the users. Where we not only got data about who the regular users at the makerspace is, but also could gain an insight into their knowledge on the matter of the subject. Which meant that we also chose to ask some questions about their experience in MakerSpace 9220, both while entering, how they found it in the first place, and more in-depth questions about the community at MakerSpace 9220. To describe the questionnaire in a better way, we will in the following section go through the questions in a thematical order and include the result thereof.

Results of Users of MakerSpace 9220

We ended up gaining the total of 17 answers on the questionnaire both from the Facebook group and some directly from MakerSpace 9220. The first questions consisted of the more general aspects. With their age, gender and occupation. Where the age spectrum was out of the 17 answers mainly 40+ and 18-24, with over half of the answers. Out of those over half (59%) identified as She/her, which was about 10 of the answers (See Appendix J). When it came to their occupation most of them had a Technology or design education, e.g., a professional Technician or a Technical designer. Only five out of the 17 did not have a technology or design education. Work wise it turned out a bit more different, where they here did not focus as much on the digital aspect, only eight of the answers said that they either worked with something technical/design or that they wanted to work with it in the future. The rest of them had various answers, with some of them not knowing what they wanted to work with or having a different kind of job like a librarian or a teacher (See Appendix J).

Following the more demographic questions, we asked them questions of their overall opinion of MakerSpace 9220 and Trekanten. This included their travels to Trekaten, as we could see some problematics in the amount of visitors and where Trekanten is located. Therefore, we asked them how they normally would travel out to Trekanten. Here over half of the answers were that they travelled there with the use of their car. The others were using either public transport or a bike (See Appendix J). Additionally to this question, we asked them their oppinion on the level of difficulty for the travels to Trekanten. Most of the users found it either very easy or just easy, and only 6% of the users thought that the travels were difficult. This can be related to that most of the users were traveling by car, and therefore might have made the travels easier (See Appendix J).

Additionally to this, we asked the users their thoughts on how easy it was for them to find the entrance to the basement (MakerSpace 9220). Which we wanted to get a broader insight into, as we ourselves thought that the entrance was hard to spot. Here surprisingly

most of them neither agreed nor disagreed with us. But there were generally more that though that the entrance was easy to find, with six users answering that. Where there only were four of the users that did not think the entrance was easy to find. Additionally, to this we also asked whether they found the sign to the basement clear. Here it was clear that most of the user agreed with the fact that it was clear, with seven of the saying they either agreed or strongly agreed with this (See Appendix J).

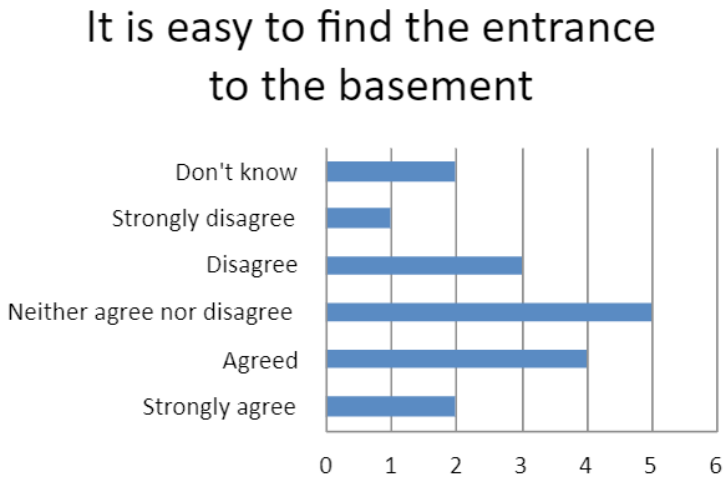


Figure 19 User Questionnaire: It is easy to find the entrance to the basement (Own Picture)

After this we asked the users how they got to know about the MakerSpace 9220, and whether it was through an ad, friends or social media, etc. with this there were several very different answers, with some finding it through an article, though their study or through word of mouth. Then we continued by asking them how often they were at MakerSpace 9220 moreover how much time they then would use there, when visiting. Here 70% of the users would say that they find themselves visiting either 1-2 times every 6 months or 1-2 times per year. More importantly only 6% of the users said that they visit 1-2 times per week, which is a very small percentage. When it then came to the amount of time they would spend while visiting, most of the users use 3-4 hours, where only 6% would use five hours (See Appendix J).

As mentioned earlier, we wanted to gain more knowledge on the community in MakerSpace 9220, which lead us to the following section of questions. First, we asked them whether they felt included in the social aspect in MakerSpace 9220. The answer showed a clear agreement in the fact that they felt included. There was only one person who strongly disagreed and did not feel included. In introspect we should here had asked why they did not feel welcome. Even though most felt included, there were also six people who neither agreed nor disagreed (see figure xx). In addition to the community aspect, we also wanted to know more about their relationship with the machines. Therefore, we asked whether they felt safe working with the machines, and here again most of the user agreed with that statement. About ten of the answers said that they felt safe when working with the machines, where only four, did not feel safe. Lastly for this section of questions, we asked the users if they found inspiration for other projects when they were there. Here fourteen of the users found inspiration, and only three did neither agree nor disagree with the sentence (see Appendix J)

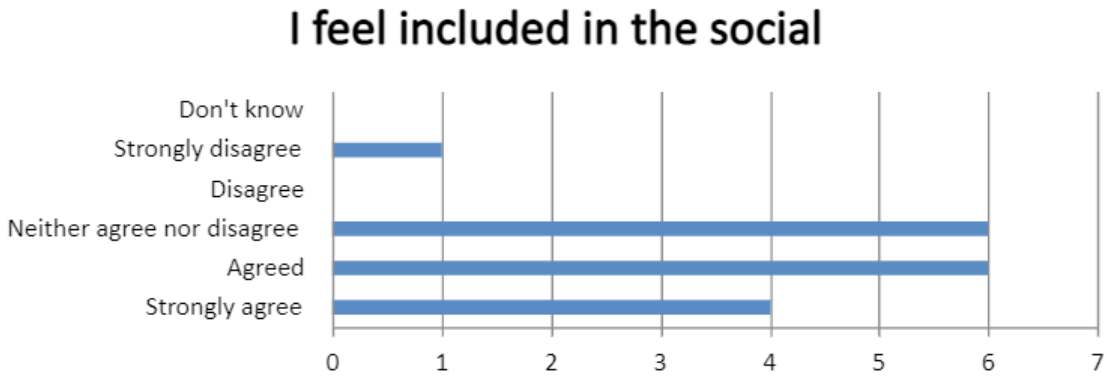


Figure 20 User Questionnaire: I feel included in the social (Own Picture)

Looking into our literature analysis (See Chapter 2. Literature Review and Theory), we knew that there was a significant gender distribution difference in the makerspaces, which lead us to ask the following questions to the users, if they were aware of the gender distribution in MakerSpace 9220. Surprisingly almost all of the users were not aware of this, with ten of them not agreeing or 4 of them neither agreeing nor disagreeing (see figure xx).

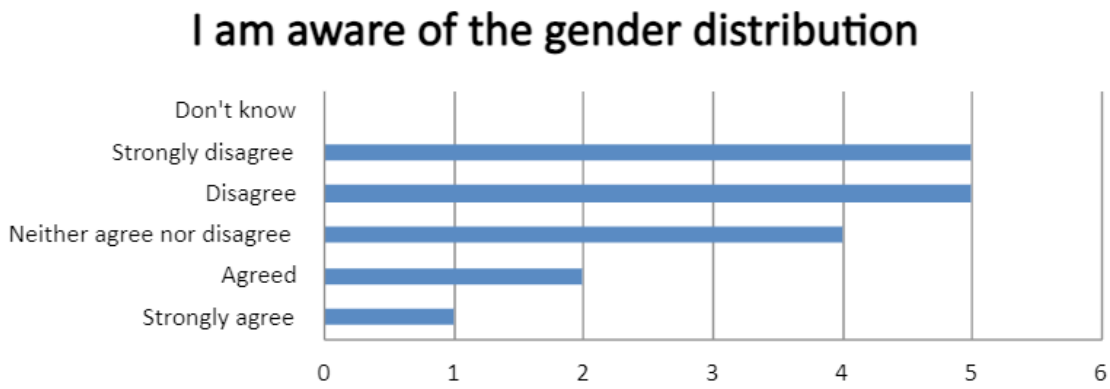


Figure 21 User Questionnaire: I am aware of the gender distribution (Own Picture)

To add to this insight, we followed that question with if they found that there were fewer women than men in the Makerspace. Where most of the users answered that they did neither agreed nor disagreed with it. But the interesting thing with this were that out of those who disagreed or agreed, there were more users that found that there were fewer women than men (see figure xx).

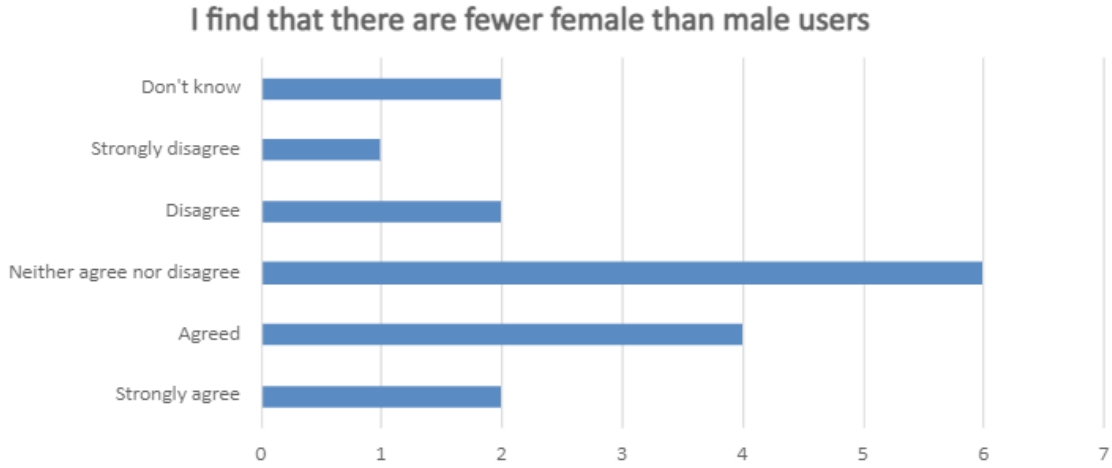


Figure 22 User Questionnaire: I find that there is fewer female than male users (Own Picture)

Additional to the earlier questions about the social aspects in MakerSpace 9220, we had a question later on that asked the user to assess if they agreed with the statement of feeling like they were apart of the community at MakerSpace 9220. As with the social aspect, the users also here mostly agreed with this statement. With nine of the users feeling like they were a part of the community and only four of them not feeling like they were a part of the community.

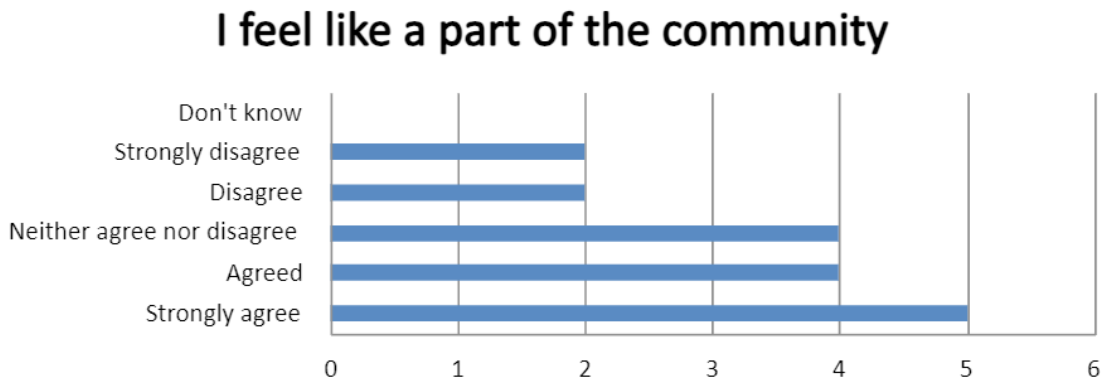


Figure 23 User Questionnaire: I feel like a part of the community (Own Picture)

Following this we then wanted to know what specifically motivated them to visit MakerSpace 9220. We then give them multiple options in the way of several different reasons that we our self could think of motivating them to visit. Instead of having a blank canvas, that they then would have to fill out themselves, we chose to give them some ideas to what might give someone motivation to visit a makerspace. Here we had included options such as 'for the community', 'working on projects' or 'to make gifts', etc. It is also to note here that the users had the opportunity to choose more than one thing, because it might happen that some of them could relate to multiple of the answers. Looking at the answers, it is obvious that most of then found their reason to go to MakerSpace 9220, to 'work on own projects'. Secondly the other answer that had most answers, where 'for fun's sake'. After that the next couple of chosen things were to 'to get help with projects', 'get inspiration' and 'to try new things' (See Appendix J).

Next of the questions we asked the user about their experience with the maschines it MakerSpace 9220. Here six and most of the users said that they had some experince. But overall most of all if a we count some of them together then nine of the users said that they had little to no experience with the maschinces (See Appendix J). Additionally, we wanted to know the comparison of the amount of users that help others and whether they provide help themselves. Therfore we asked them with a scale question on how often

they do either cases. Where we saw that most of the users, about 14 of them, never, rarely or sometimes help others. But almost all of them, exept for one get help from others (see figure xx & xx).

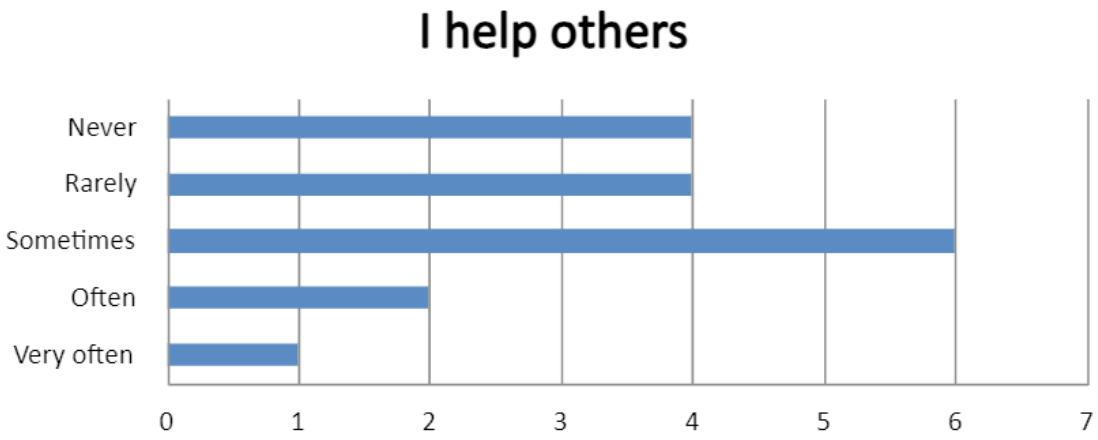


Figure 24 User Questionnaire: I help others (Own Picture)

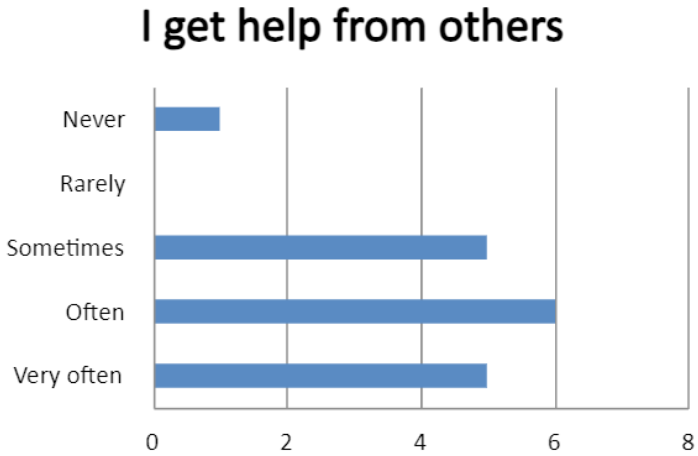


Figure 25 User Questionnaire: I get help from others (Own Picture)

Lastely we asked the users if they had any thoughts, ideas or other comments, on what initiatives MakerSpace 9220 can take to get more users. Here there where ten of the users who send in some of their ideas. Some of the ideas were e.g. “More structured training

in the machines and the associated programs to create designs" and "closer cooperation with higher education institutions[…]" (See Appendix J). We will go more through them in the discussion and next section with the Affinity diagram.

Besides the questionaire we mentioned in the section of the worskshop that we also gave the participants an demographic questionaire(See Appendix K). Where we asked them about their age, gender identity, occupation, their journey to Trekanten and privious knowledge of Trekanten. As mentioned ealier, the participants age ranged from 18-29 mostly, with the ecception of one who was 40+. Occupation wise as we had reached out to a specific type of user, it was expected that most of them were in some kind of design/ technology education and job. Most of them also came by car and everyone of them exept for the one traveling by bus found it very easy or easy. Where the one traveling by bus found it straightfoward, but not necessarily easy.

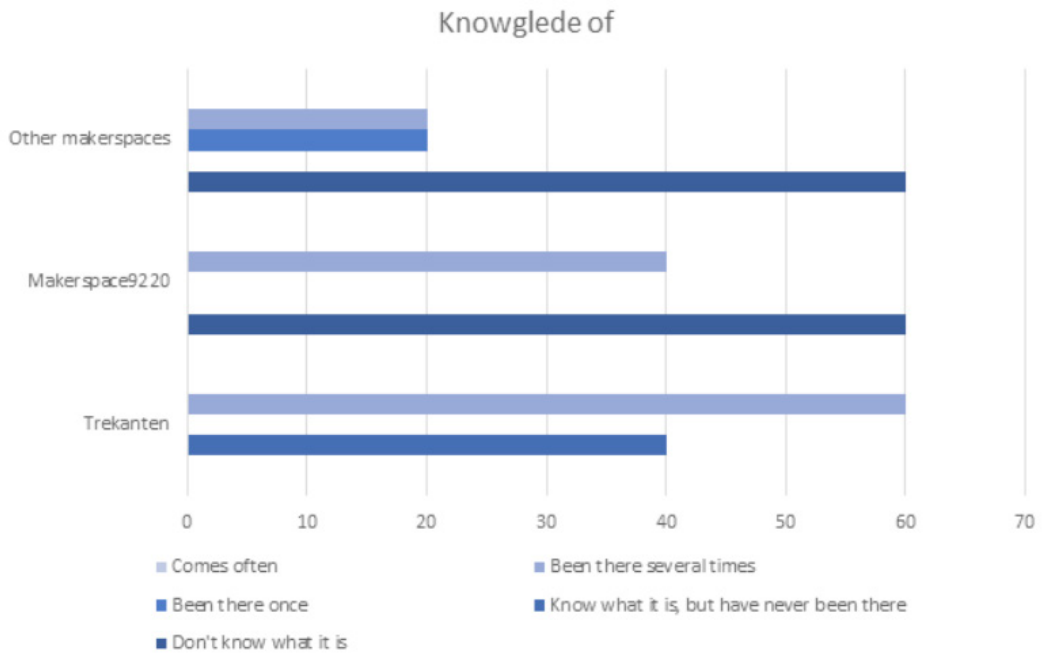


Figure 26 User Questionnaire: Knowledge of other makerspaces, MakerSpace 9220, Trekanten (Own Picture)

Lastly we asked the participants about their knowledge of not only Trekanten, but also MakerSpace 9220 and other makerspaces in general. This was to see if there were a

diffence in their prior knowledge of makerspaces, and if they prio to this workshop had known of MakerSpace 9220 or any other makerspaces in general. It was afterwards found with this, that most of the participants, 60%, did not know what MakerSpace 9220 was or even what a makerspace was. Here the interesting thing was that everyone of the participants knew of Trekanten beforehand and had either been there multiple times or knew what it was, but had never been there (see figure xx).

5.5 Affinity Diagram and Coding

After our data-gathering sessions, we started the analysis phase. We collected all the data from the seven different datasets, coded them and then analysed and compared the findings from the different types of data sets. We coded the datasets in a specific way to ensure we knew where the data came from and to make it easier to trace the data back to its origin if needed. The different datasets got a letter matching the name of the dataset, and if there was more than one set from the same method, we differentiated with numbers. For example, in the Experience Matrices, all group members analysed MakerSpace 9220 individually, and therefore the datasets are named M1, M2 and M3 (See Figure XX and Appendix C for QR code to Miro).

Figure 27 SCAN ME! QR code to Affinity Diagram on Miro (Own Picture)

Experience Matrices - MakerSpace 9220	M1-3
Experience Matrices - Art By Me	A1
Demographic Questionnaire	D1
Observation Sheet	O1
Reflective Question	R1-5
Transcription	T1
User questionnaire	S1

Figure 28 Overview of how our various data collections are coded (Own Picture)

We coded every group member with a number and an F for Facilitator, i.e., F1, F2 and F3, and the Workshop facilitator as WF. The participants were coded as P1 to P5 to make their identities anonymous and differentiate them from each other.

Every sentence we deemed usable or valuable got a code; the document's letter, a number to refer to a sequence of paragraphs and possibly an extra letter. For example, if it is the first sentence in the Demographic Questionnaire, the code will be D1-01, D1 refers to the document name, and 01 refers to the paragraph which the equivalent number in that document. The coded sentence to write in the Affinity post-it becomes "D1-01 Majority of participants are in the age group 25-29".

If more than one sentence in the same paragraph had a valuable point, they would get a letter after the last number. For example, in the transcription from the Focus Group Interview, a paragraph says: "Well, I think it is. I think it's creative and cosy and... Hmm. What to say, like that, mm? Makes me want to go exploring. Explorative. I don't know how to say if you can call a room that?" The excerpts we wanted to include because they could bring value to the analysis were "I think it's creative and cosy" and "makes me

want to go exploring". To exemplify that the two sentences came from the same paragraph, we encoded the first sentence as "T1-01a" and the second as "T1-01b".

The coding helped us to know precisely where the sentence came from, both document origin and where within the document. This allowed us, later in the process, if we needed to clarify what exactly the post-it notes referred to. At the end of the encoding process, we had more than 530 notes from our seven datasets. We used the online digital whiteboard platform Miro Board (See Appendix C) to keep track of all 530 post-its.

To analyse the data we had gathered, we used the Affinity Diagram method described in Section 4.4 Affinity. The first step was to categorise the data into a sentence. It is essential that the notes find the sentences and the notes they have a common feature with. In other words, it is important to cluster the notes based on similar contextual elements, common features and themes. It is essential that the sentence is not chosen in advance but deduced through the data and therefore is specific to the data set. We divided the yellow post-its into three pillars, and every group member got one pile to sort out into columns with other post-its. To make it easier for us to sort the 530 post-its, they got a pink post with a heading on, before we did another round, taking one column at a time and did the final clustering and wrote a sentence on a blue post-it for every cluster.

The data gathered from the Art By Me Experience Matrice had many notes describing the space, which is still relevant for our study. However, since the Affinity diagram's function is mainly to explore our problem, we decided to remove most of the Art By Me descriptions and only use the notes that still have potential use for our study, for example, the post-its with different ideas for improvements. The column got the heading "Best practices" and got notes like "A1-14c Booklets at the tables with visual instructions.", "A1-12a Small cards with tips" and "A1- 24a colours, examples are inspiring". After the second sorting, these post-its ended up in blue sentences such as "Ideas to take with us

from other places could be more visual info about tools and techniques on brochures, cards or similar elements" and "I like the colour scheme and inspiring examples at Art by Me".

If notes did not fit into clusters or were inadequate to stand alone, we moved them to a "sort later" pile that we looked at after being through all the other columns. After going through the "sort later" pile, we ended up with six post-its that did not seem to bring anything significant to the analysis, and therefore we did not use these notes further in the process. These notes contained sentences such as "M1-06 Enjoyment: well...", "O1-01a Three decided to fill out the demographic on paper", and "O2 – 04b "Holy moly". After re-sorting the cluster again and making the blue sentence, another six post-its made it to the trash pile. That were notes like "O1-09a P1 sits a lot with her chin on her hand", "O1-06 Sits down on the sofa first, is suggested to sit on the cushions." and "O2 – 12d Alternately leaning back and forth.".

Blue post-its

After the first step, we ended up with 121 sentences that we wrote on the blue post-its above a line of the original yellow post-its they represent. Each blue post-it is written as a phrase a person would typically say. An example phrase would be "I feel familiar with the machines and can see opportunities to explore with them". This sentence was derived from the five post-its: "S1-09 Almost 2/3 thinks they feel safe round the machines", "M1-03 Many different machines, many options", "R3-08 tools are not an obstacle but an opportunity.", "T1-45b A lot of the machines you can try to explore" and "M3 – 10a You can use a lot of machines and tools". These five post-its were based on data gathered from various sources such as the Superuser Questionnaire, the Experience Matrices at MakerSpace 9220, Reflective Questions, and the Focus Group Interview. The number of yellow post-its in one line may vary depending on how many post-its are related to each other and how the cluster was formed. Additionally, the original post-its may come from one or more different data gatherings, depending on the cluster and the grouped post-its.

Figure 29 Example of Blue post-its (Own Picture)

It differs in how many yellow post-its ended up in each column. Some only have one, for example, the sentence from one of the answers from the reflective question "R1-05 You could also open on weekends for families with children, e.g." which we found challenging to cluster with any other post-its. This yellow post-it was titled with the blue sentence, "I would like to visit in the weekends with my kids". It got this sentence since it was the only post-it with an improvement for creating events or similar with families with kids as the target group who want to visit MakerSpace 9220 in the weekends. At the other end of the scale, the blue sentence with the most yellow post-its is about where the users from our Superuser questionnaire know of MakerSpace 9220, containing thirteen yellow post-its. In that one, the blue sentence ended up being, "I have heard about MakerSpace 9220 from various sources such as friends & family, Facebook, University, projects & articles, and businesses".

Another big cluster with thirteen yellow post-its is "The facilitator activates the participants". In this cluster, all of the yellow post-its come from the three observation sheets

and are regarding observations of the Workshop facilitator and how he got the participants to participate in the activity he had planned actively. Many yellow post-its regarding the Workshop facilitator ended up in one big column from the first sorting. After the second sorting, we differentiated the post-its regarding the Workshop facilitator due to the minor variations in them, and they ended up in three different blue post-its clusters, "The facilitator is pleasant and good at noticing when I need help", "The facilitator is trustworthy, direct, active and verbal in leadership style" and "The facilitator activates the participants". Most of the yellow post-its from these three blue sentences come from the observation, but there is also some from the focus group interview and the reflective questions. The difference between the three sentences is that the first one contains notes like "O3 – 03b WF is very relaxed.", "T1-18 then he was just so, super nice and lovely. That it made no difference so very quickly," and "T1-54d I think he was good at reading who needs help", which shows how the Workshop facilitator facilitates the workshop he had arranged, how well he noticed the participants need of help and how pleasant he was and relaxed in the role as a facilitator. The other blue sentence, "The facilitator is trustworthy, direct, active and verbal in leadership style" has yellow post-its like "O1-15 WF is direct in their leader style during this session" and "O1-04 WF was described as verbal", and they all describe how the workshop facilitator seems trustworthy and has a direct, active and verbal leadership style, which describes how he handled the workshop with a teacher-student leadership style where he walked back and forth talking and helping. The last blue sentence regarding the workshop facilitator says, "The facilitator activates the participants" and has yellow post-its that say, "O1-10f WF takes over the computer for a while to help them", "O1-07d WF asks if there are any questions" and "O1-07c WF shows examples in the room on what you can make on the machines" that describes how the workshop facilitator activates the participants by showing them examples on what they can make on the different machines, and how he helps them by taking over the computer showing how they have to do it.

So, we divided the big cluster with all of the workshop facilitator-related post-its into three clusters due to the slight differences in the meaning of every yellow post-it. That led to three blue sentences with the difference that one describes how the workshop facilitator is trustworthy and direct in his leadership style, the other describes how the workshop facilitator activates the participants by showing examples made on the different machines, and the last one describes how the workshop facilitator activates the participants in guiding and helping them through the workshop.

The blue sentence "I feel familiar with the machines and can see opportunities to explore with them" comes from five yellow post-its from the superuser questionnaire "S1-09 Almost 2/3 think they feel safe around the machines", experience matrix "M1-03 Many different machines, many options" and "M3 – 10a You can use a lot of machines and tools", the reflective question "R3-08 tools are not an obstacle but an opportunity", and focus group interview "T1-45b A lot of the machines you can try to explore". These separate but connected post-its show that the different data gatherings bring up different aspects of the same blue sentence.

Pink post-its

The next step in the affinity analysis is to bring all of the 121 blue post-its into one big pile, and cluster them together, as in the first step, to make a pink post-it. In this step, the pink post covers a larger group of the data set and is, like the blue post-its, a sentence written in a personal voice but with a more general tone.

In this step, we culminated in 39 pink post-its describing the 121 blue post-its, which in turn describe the more than 530 yellow post-its we started with at the beginning of the affinity diagram process. It differs in how many blue post-its can be found in each cluster. On the one hand, two clusters have only one blue post-it; on the other hand, there are two clusters with six post-its each. How many post-its are in every cluster depends on how they are categorised and formed into groups.

One of the pink post-it says, “Many ideas for improvements have been suggested based on users’ experience, the most notable once concerning payment methods and visual instructions”, and comes from the three blue post-its, “I have contributional ideas such as booklets, catalogue, models and previous projects”, “An idea for making payments easier could be punch cards or credits instead of paying small change every time” and “Ideas to take with us from other places could be more visual info about tools and techniques on brochures, cards or similar elements” which originates in all of the data that describes improvements that can be made in MakerSpace 9220 that both take inspiration from Art By Me but also from comments in the Superuser Questionnaire. In this example, the one pink post-it represents three blue post-its, each representing four, one and five yellow post-its. Therefore this one pink post-it represents nine yellow post-its.

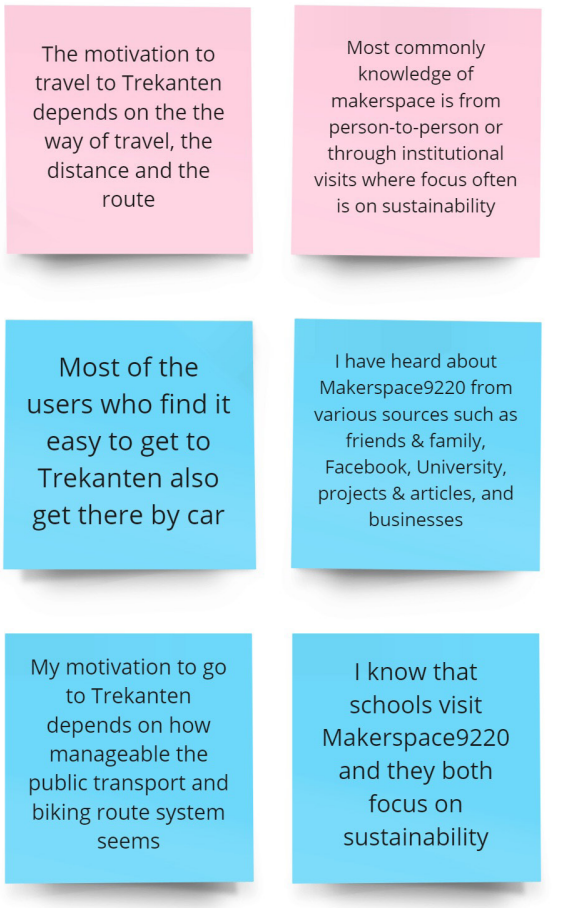


Figure 30 Example of Pink post-its

(Own Picture)

In this step, we were not allowed to put any blue post-its in the trash, but we still had a pile with post-its we did not have a cluster for when we got to it and that we looked into later. That means that every blue post-it made it through this step.

Another pink post-it says, “The machines at the makerspace attract and frighten people, they are invaluable as they offer exploration and possibilities to build but are also intimidating because of their expensive and uninviting exterior.” This shows the inconsistency between some of the users who are attracted and frightened by the machines and the inconsistency between wanting to use the machines and being intimidated by them.

Green post-its

The last step in the Affinity diagram is the green post-its. In this step, we clustered the pink post-its and wrote a green post with an overarching theme. We ended up making 12 green theme post-its from the 39 pink post-its. The 12 themes are “Community is beneficial”, “Improvements”, “Resources vs Limitations”, “The DIY experience”, “Changing norms”, “Regulars’ norms”, “Irregulars’ knowing”, “Natural occurrence vs set experiment”, “Users’ interest”, “Self-sufficiency through learning”, “Overwhelming, insecure, frustrating” and “Inviting Atmosphere VS Contradicting Impressions”.

Figure 31 Example of Green post-its, also called Theme post-its (Own Picture)

The affinity diagram analysis ended up with a pyramid with green post-its at the top, pink post-its on the next row, blue post-its on the third row, and all yellow post-its at the bottom row. This pyramid shows which post-its are the foundation for the twelve themes we ended up with.

The affinity diagram method helped us work with our big data pile and go in-depth with the insights we had gathered.

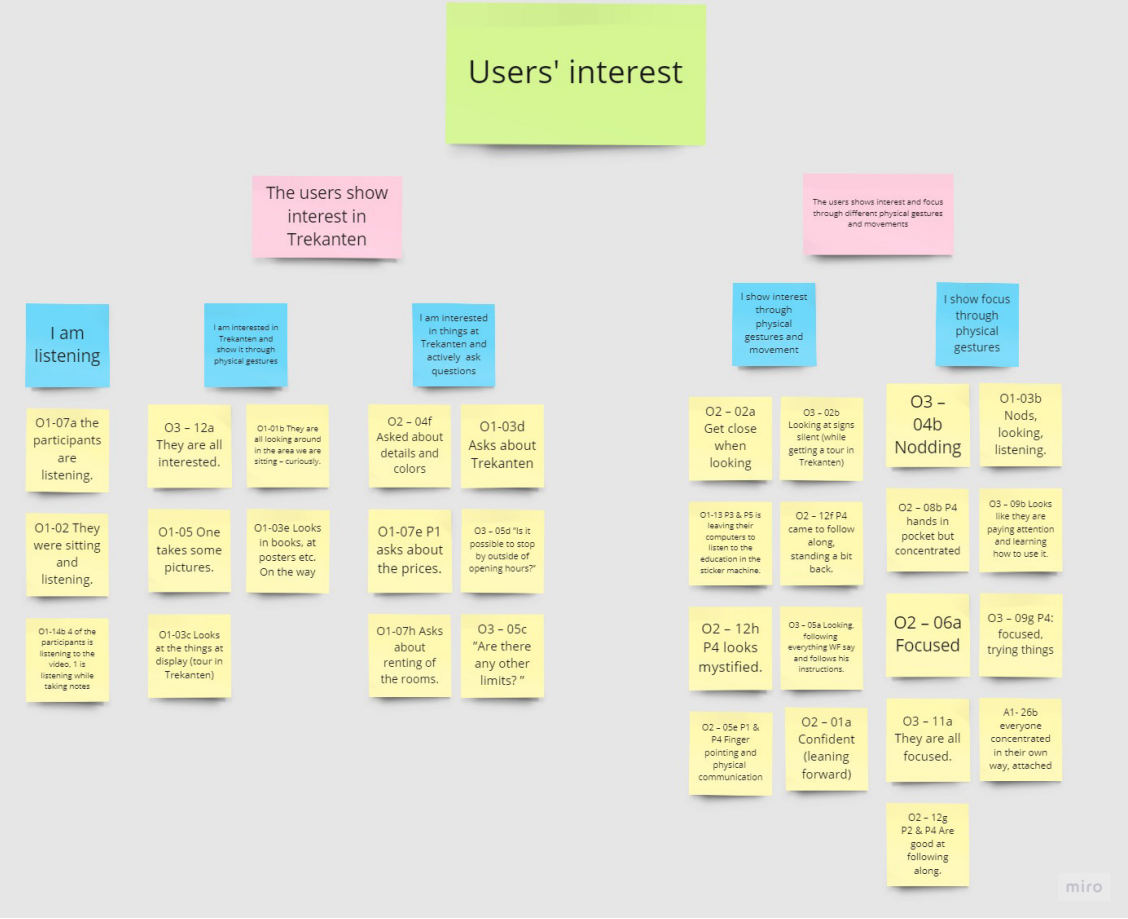


Figure 32 Example of how the various post-its at the end stage of the affinity diagram analysis where sorted and structured into a pyramid with Theme post-its on the top followed by Pink, Blue and finally yellow post-its with raw coding (Own Picture)

5.6 Iteration of the problem area

After we did the affinity diagram analysis, we worked on our problem area and problem statements due to the new insights we got into our problem area after working with our data gathering.

Before the affinity diagram analysis, the problem statement was “How can theories and models from Experience Design be applied to transform the overall experience of MakerSpace 9220 to create an inclusive atmosphere that is welcoming to women while still maintaining the current members’ community?” with the subquestion “Can we encourage more women to become part of MakerSpace 9220, and is there an observable change after our intervention?”. From this problem statement and analysis, every group member wrote down keywords they thought were the most critical insights from our study. Out of that came 24 keywords, which we clustered into six groups that shared similar meanings.

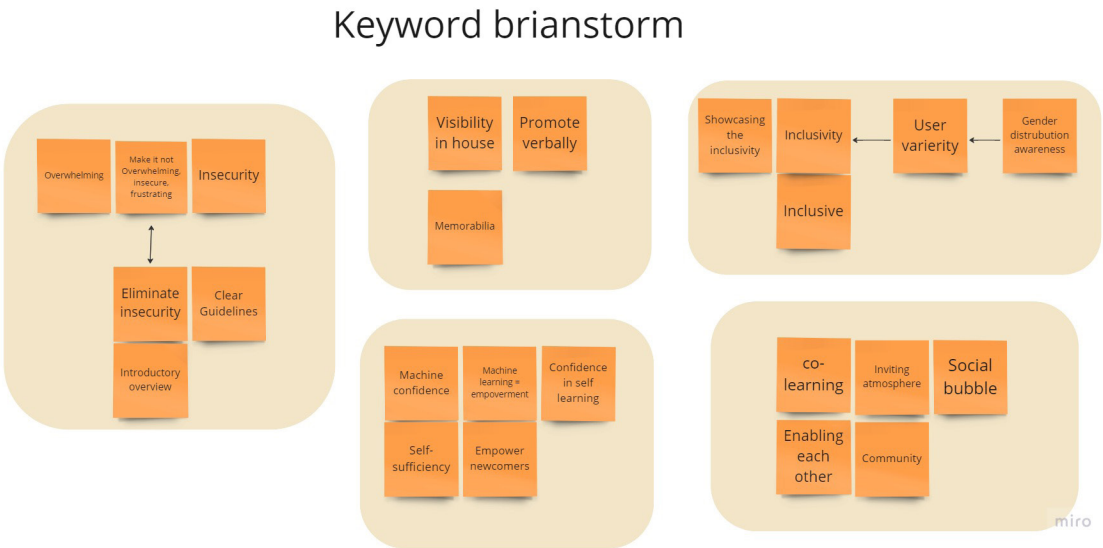


Figure 33 Keyword brainstorm (Own Picture)

The first group included “Overwhelming”, “Insecurity”, and “Make it not Overwhelming, insecure, frustrating”, which are some of the main problems we saw from our affinity analysis. They led to the second group, which includes “Eliminate insecurity”, “Clear Guidelines”, and “Introductory overview”, which can be part of building potential solutions to the problems we saw in the analysis. This group mainly originates from the green post-it “Overwhelming, insecure, frustrating” because of the unclear guidelines that lead to the users feeling insecure, but also that the learning curve the users face is often steep and frustrating due to the number of tools and steps to remember. It also originates from the fact that machines can feel intimidating and overwhelming to learn and use, where some kind of introduction would be beneficial.

The third keyword cluster is regarding the machines and self-efficacy we saw in MakerSpace 9220 and includes the keywords “Machine confidence”, “Machine learning = empowerment”, “Confidence in self-learning”, “Self-sufficiency”, and “Empower newcomers”. These keywords originate from the green post-it “Self-sufficiency through learning” and the theory about self-efficacy. The green post-it originates from the observations where the Workshop Facilitator teaches P2 to make a sticker on the folio machine, and then P2 teaches the other participants to use this machine, but also from both the superuser questionnaire and the reflective questions, where the users ask for more structured training in the machines, that would make the users more secure in using the machines and boost the users’ confidence in their skills (self-efficacy).

The fourth cluster of keywords includes “co-learning”, “Enabling each other”, “Inviting atmosphere”, “Community”, and “Social bubble”, which originates from the green post-its “Community is beneficial” and “Inviting Atmosphere VS Contradicting Impressions”. That the community is beneficial is something we also noticed in our literature review, but we also recognised in our data users who answered that they feel like they are a part of the MakerSpace 9220 community and that being in MakerSpace 9220 makes them

happy and want to be creative and help each other. The data gathering also showed us that the atmosphere at Trekanten is good, but the interior is contradictory because the interior is organised yet messy and confusing, and the things used to decorate the room are a mishmash of different things but warm and cosy.

The fifth cluster includes “Gender distribution awareness”, which leads to “User variety”, which further leads to “Showcasing the inclusivity”, “Inclusive”, and “Inclusivity”. These keywords originate from the green post-it “Changing norms” and, based on our literature review, indicate that our topic, women in makerspaces, is close to some of our participants’ hearts, but other users are unaware of the gender distribution. However, in the end, both the users and our participants want MakerSpace 9220 to be an inclusive place with room for everyone, no matter what gender they identify as.

After we discussed the keywords and our old problem statement, we took some time individually to write proposals for an iterated problem statement that culminated in a deeper discussion of the better parts of all of our problem statements. This led to four parts that had potential and the direction we wanted to go with and also contained the main problems we found in the affinity analysis. The four parts from our problem statements we worked with were “thereby creating a larger and more diverse community of fellow co-learners?”, “that minimise their machine insecurity and improve the communal empowerment”, “for new and old members of MakerSpace 9220, so that women feel empowered and confident to work with the machines to minimise their machine insecurity and improve the communal empowerment, thereby creating a larger and more diverse community of fellow co-learners?“, and “make events for new members at MakerSpace 9220 so that they feel empowered and confident to work with the machines”.

The 24 keywords, helped us develop the following problem statement:

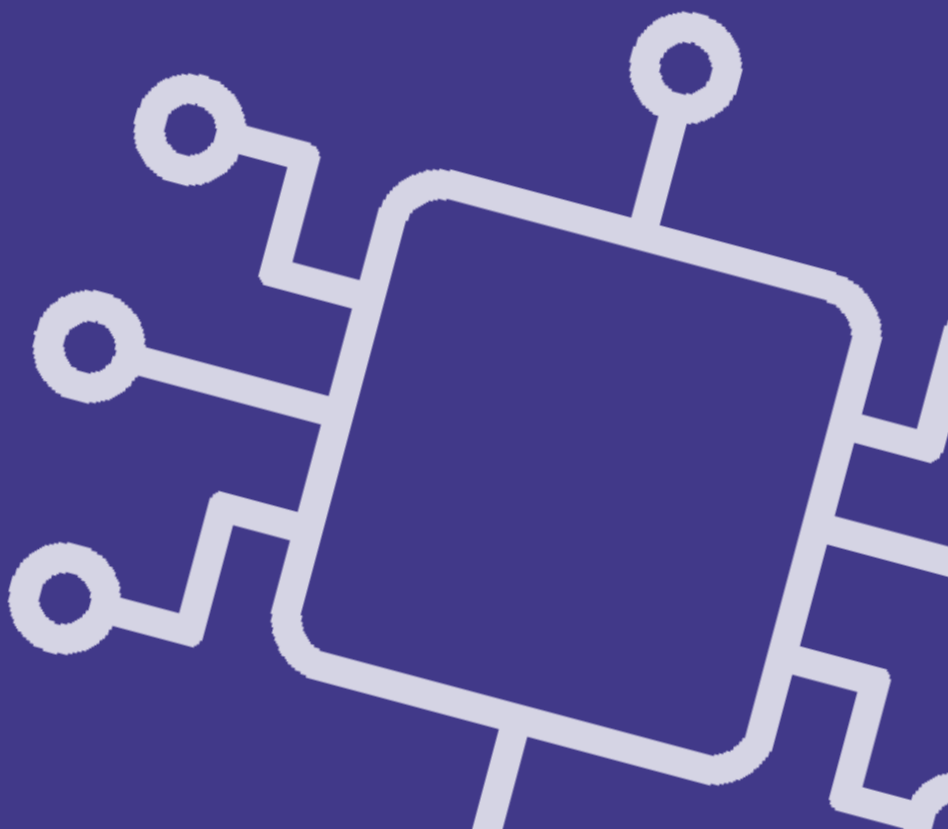
How can we, with theories, methods and models from experience design, design interventions for Makerspace 9220 that advocate for inclusivity, so that women feel empowered and confident with the machines, thereby creating a larger and more diverse community of fellow co-learners.

After reassessing the problem statement with the use these 24 extrapolated keywords and connecting them to our affinity diagram, we found it important to emphasise some of the relevant headings this process resulted in:

- The Role of the Facilitator
- Community
- Visibility
- Gender Inclusivity

These four headings enabled us to reflectively scrutinise our literature review, theories, and the findings in our study with a wider lens (See the following Chapter 6. Discussion, for a more detailed explanation and investigation into the topics these four headings encapsulate).

6. Discussion



6. Discussion

In this chapter, we have entered the evaluating action phase of this thesis (See section 1.3.2 Action Research). Following the revisions to our problem statement, we will comprehensively examine the outcomes of this study, employing a broader lens to scrutinise and discuss our literature review, theories, and findings. As detailed in 5.6 Iteration of Problem Area, our analysis has been distilled into four main categories that encapsulate the wealth of data we gathered. Each category offers a separate section that we believe can contribute to a more nuanced understanding of the interconnectedness of all our findings. The sections include 6.1 The Role of the Facilitator, which greatly impacted our insights and research direction; 6.2 Community, a prevalent factor in MakerSpace 9220 that strengthens social bonds; 6.3 Visibility, which covers three distinct aspects of this concept; and 6.4 Gender Inclusivity, a vital facet for ensuring that all individuals feel acknowledged, welcomed, and included.

It is important to clarify that we are not claiming to present an exhaustive solution to our problem area. Instead, we are offering our perspective and opening up the discussion. Our hope is that this approach will invite further discussions and lead to suggestions for improving the factors that shape experiences in MakerSpace 9220.

As we embark on this discussion chapter, beginning with the role of the facilitator, we will first clarify that we in this chapter represent numerous points of view, those of our collective and individual voices as researchers, that of the workshop facilitator, and those of our five research participants, as well as comments and opinions from current and past users of MakerSpace 9220 through the online questionnaire.

6.1 The Role of the Facilitator

At the beginning of this thesis, we focused more on the physical frames that make up an experience room and general experience by arranging as authentic an experience as possible for the participants to undergo in MakerSpace 9220. After initial impressions, we suspected that the direction we had taken with our research might not have been as relevant as we first thought at the beginning of this thesis, and after the detailed affinity diagram analysis, we discovered that a shift in focus was necessary to progress.

Our investigation revealed that the Workshop Facilitator's (WF) actions significantly shaped the participants' experiences during the workshop, and his observation sparked our interest in the role of facilitators in shaping experiences. Therefore, we wanted to understand how the WF's actions impacted the participants and how these interactions can influence users' experiences, particularly women, in makerspaces. Despite our compelling findings, it is important to note that our expertise lies outside of the field of learning psychology. As such, while we do not have the requisite knowledge to analyse the facilitator's teaching methods, we are better positioned to comment on the participants' experiences and the facilitator's influence thereon. In the ensuing section, we will explore key insights and aspects we noticed during our study and attempt to account for the facilitator's impact on the overall experience. Moreover, to ensure an authentic reflection of a typical makerspace experience, we deliberately kept our directives to the WF to a minimum when choosing the workshop activity. This approach aimed to provide him with sufficient agency to mirror the structure of informal day-to-day operating hours.

The WF is the manager and daily facilitator of MakerSpace 9220 (Cf. Section 1.1 Trekanten, Bibliotek og Kulturhus). He is usually the one present during the opening hours, and he is the one facilitating when groups and schools have booked the space. These facts were one of the main reasons why we chose him to facilitate our workshop and because his expertise in arranging fitting activities for our participants was of great help.

Early in our observations, we noted that the role of the workshop facilitator had a greater impact on our participants than we initially anticipated. We all documented positive feedback regarding his facilitation methods, for example: “O1-15 WF demonstrates a direct leadership style during this session” (See Appendix XX, observation sheet). His assertive approach enabled him to guide participants effectively, leading them to experience a sense of surprise and happiness about the possibilities offered within a makerspace. A standout aspect of his leadership style was his active assistance to the participants. This not only served as encouragement but also proved especially beneficial for those who were newcomers to the makerspace environment. The collective response from the participants echoed a positive impression of the facilitator, which was most evident when he helped them with their tasks. This highlights the significant role that facilitation can play in enhancing participants’ experiences within a makerspace.

The way the WF helped the participants and how much that effected their overall experience during the workshop showed in how he was able to notice when someone was in need of help“T1-54d I think he was good at reading who needs help”, his approaches to help, made an impression on the participants “R2-09 Facilitation of techniques made all the difference”. Additionally, some of them mentioned that the WF was a pleasant mentor and that his techniques made all the difference in how they learned during the activity. We found it interesting how much the teaching style meant to the overall experience and that when the WF noticed someone needed help, it made a huge difference in how the participants would feel acknowledged. Therefore, we found it interesting that none of the papers from our literature review pointed out the importance of the facilitator. This question led us to see what other parts of our data, regarding how the teaching and learning of machines in makerspaces could be a larger part of the motivation to join and participate in makerspace activities.

From the MakerSpace 9220 user questionnaire (See Appendix J), we noticed that there are more users who 'get help' from others than users that 'give help'. This could indicate that the facilitators have a somewhat important role for many users "O3 – 06b WF is guiding them through the workshop". Moreover, it shows that users are more prone to want to ask for help than help others. If this is the case, it could also mean that users might not see themselves as able to help others, indicating low self-efficacy, which in some cases might mean that they put much trust in the facilitator.

Based on our reflections, the facilitator can be someone that users can put their trust in but can also motivate and encourage. The facilitator is, in many ways, a role model for the users (See Section, 2.3.5 Concept of Self-Efficacy, for further explanation of the term). The users that are getting help from the facilitator are not only learning, but in many cases, able to copy the facilitator's actions, so they produce greater behavioural improvements and be more confident in their abilities to execute it by themselves later. Bandura (1977; 1993) also pointed out that the role model can be digital, which fits with the choice of following video tutorials as a supportive tool for achieving learning and results in the makerspace.

We observed that in some cases, the WF would take over for the participants if he noticed that they were struggling with the program "O1-10f WF takes over the computer for a while to help them" This is seen as a way of facilitating among the different styles of facilitating he used during the workshop.

As pointed out, a video tutorial was used as a supportive tool during the workshop. It showed the participants a step-by-step guide to creating a nametag using the programme they were tasked to use. Though this might be a helpful tool, it also seemed to be influencing the participants negatively. This was not because the video was bad or did not provide the right amount of information. On the contrary, it gave a lot of very important

information to the participants, but the video length took up a lot of their time “R5-02 I think I could use a little more time (both watching the video and using the program)”. Many of the participants needed more time, especially to see the video. There are benefits and disadvantages of using video as a teaching or support tool. As people process information and learn differently, it seemed overwhelming for some participants because they had to learn how to use the programme while watching a long video for the first time.

The role of a model or mentor, in this case, the workshop facilitator (WF), is crucial in augmenting users’ self-efficacy. Understanding that learning styles and paces differ amongst individuals, some may require demonstrations multiple times while others can proceed independently after just one set of instructions. As we observed with the WF, boosting self-efficacy can be achieved through verbal encouragement from the role model. A participant shared, “T1-54e he gives me a task that I then have to learn from, which in some way also gives me a sense of ownership” and “T1-54f the self-confidence, whereby he trusts that I’ll be able to teach, that’s also very empowering.”

However, it is crucial to strike a balance, as excessive verbal encouragement might inadvertently create anxiety or pressure for some users. For example, one participant did not feel confident in her ability to operate independently after the WF suggested that she could do so next time, stating, “T1-20 he was perhaps a little quick to say that next time you do it yourself on that laser machine.” Therefore, it is essential to tailor encouragement to each individual’s comfort level and learning pace to foster self-efficacy and overall confidence within the makerspace.

The WF managed participants effectively by arranging them in pairs, which benefitted the groups in multiple ways. It allowed the WF to guide multiple participants simultaneously and created a collaborative environment where participants could share advice, offer assistance, and boost each other’s confidence. This positive group dynamic we ob-

served in our workshop may not resonate with all users. Each individual has preferences; some might not feel comfortable being paired or working alone, like P2. For instance, a participant expressed, "T1-28d I would prefer to come here if I have the opportunity to sit in […] my own little world and do something." This emphasises that people have distinct learning styles and work habits - some prefer solitary work in the makerspace, while others enjoy collaboration.

The role of the facilitator can be highly situational. In our workshop, participants were amenable to following the WF's guidelines, including working in pairs due to circumstances. The fact that they knew they were attending a workshop and that most had never been in a makerspace before might have made them more receptive to the WF's structure. Lacking prior knowledge of the norms and operations of a makerspace, they were open to experiencing a small snapshot of what it is like within the facilitator's guidelines. However, it is important to consider that this experience could be vastly different outside of this facilitated workshop setting, where individuals visit the makerspace based on their motivations and under their own terms. Therefore, it is crucial to recognise and respect the diverse preferences of makerspace users, even while optimising group dynamics in workshop settings.

When looking at the facilitators role through the lens of some of our chosen theories, we noticed some interesting connections, between the confidence our participants showed during the workshop and in which the facilitator can therefore effectively help change the users' will and motivation to use the makerspace. A way to interpret the fact that the participants did not want to cease the activity part of the workshop could be attributed to Apter's (1989) telic and paratelic states, as in the participants were highly motivated to fulfil the given task, some of them in a goal oriented way and others because they enjoyed the process so much that they did want to stop, as in a paratelic state.

But if a facilitator can help the user, by either encouraging or visibly guiding them through it, that might help them become more motivated to do the task and to in the first place to come use the makerspace. There is multiple other ways for the facilitator to motivate or encourage the users. Not only can they stand in as a role model, showing how things are done, but they can try and affect either users extrinsic or intrinsic motivation. Extrinsic can, for example, be done by motivating them to complete a task and win something at the end, or learn to create a product they want. We could see that the participants became more interested in creating their nametag with the laser cutter; this could relate to intrinsic, as it gives them something that is just for them and extrinsic, as they ended up with memorabilia that they could take home (Cf. Chapter 2. Literature Review and Theory).

Relating this to our theories, the users' experience can vary depending on their motivation, if they after 'an experience' is at its end, according to both Dewey(1939), Jantzen(2011) and Kahneman(2003), one will form an overall view on that experience, whether it be Jantzen's, 'Change' 'wonder and 'transform, Dewey's beginning middle and end, or Kahneman's 'instant utility', 'Remembered utility' and 'total utility', they all describe the way experiences are in different ways valued. This means that when a participant is not helped in the way that they need or their script (Schank and Abelson, 1977) is disrupted, or a norm break happens, maybe because of the way one might think a facilitator ought to help them, but instead makes them more anxious. All of the above can affect how they view the experience. According to both Abelson and Jantzen, it can affect the experience, so they might not want to return to a makerspace. As mentioned in the theory chapter, we do not fully agree with some of the theoretical aspects of cognition and the valuation of experiences. With this we are referring to Kahneman's good and bad scale, where the experience is not only a cognitive assessment of whether it was good or bad, but users might experience something that they did not like but might not affect their overall impression of the makerspace and the facilitator. It is in many instances, possible to be critical of a place, but that necessary does not mean that it makes them less motivated to

show up. We wanted to include this in this section, as we felt it was important to note that the users have some requirements for them to want to come back, especially regarding the facilitator. In many ways, the facilitator is a big part of motivation, especially when learning and feeling confident. “T1-05d the space might have felt more intimidating than it does right now”. (After introduction of machines). This was one of the comments from the participants, meaning that the facilitator’s way of introducing helped limit some fear or intimidation with the participants, making the experience feel better.

Generally, the facilitator at MakerSpace 9220 will have to deal with various amounts of users. This in our study then means that sometimes the facilitator will have to keep an eye on only a few people, like in our workshop with only five participants. Nevertheless, sometimes they can have more users in the space during normal opening hours. This can then change the facilitator’s attention, as they sometimes must keep in mind of more than only a small group user. It might be more bearable for them to have it under control when there is a smaller number of users simultaneously, than when there are many users simultaneously. In our workshop with a smaller group of users, it seemed easier for the facilitator to see when a user needed help. However, if there suddenly are ten users that need help at the same time, it might disrupt not only the users’ experience but it will affect everyone in the room, “T1-26a if I come here and there are like 50 people sitting in here. I can’t really handle that”.

In our MakerSpace 9220 user questionnaire, we had a user who commented specifically on the staff at makerspace, “S1-18f Think they have reached max capacity compared to the small amount of volunteers they have”, Meaning that they do not think that because of the small number of volunteers at Trekanten or MakerSpace 9220, it would be too much to handle for the volunteers to have more users than there already are. This was a fascinating point to keep in mind because it shows that if we are trying to get more users

to the makerspace, the users think that getting more would be too many for the facilitators to handle. This raises the question of whether trying to get more users to MakerSpace 9220 is something they can handle.

In this scenario, the difference in users will also be important to the WF´s role, e.g., the users' prior self-efficacy and confidence in using the different machines. For someone like P2 when being taught to use the folio cutter, they can show more confidence and self-efficacy. However, sometimes users have a lower amount of self-efficacy, which might frighten them to put them in a position they will not like. During the interview, there seemed to be an agreement on the matter of the difference in users. One of them mentioned, "T1-20: he was perhaps a little quick to say that next time you do it yourself on that laser machine" (see Appendix x). Henceforth the role of the facilitator is also to notice and recognise which people are capable of enduring certain spontaneous situations. Some users might not be comfortable being put in the same situation as P2, and others might learn more those ways. The reason why this is an important insight is, how it relates to the was a teacher/facilitator can help different people. Mainly because, some users are very confident in their abilities and dives directly into the activities, but some users need more help from the facilitator, if they are not as confident in their own abilities. Additionally, the participant mentioned that an introduction to the machines would help most users, and that their specific scenario, where it was their first time, they needed more time to become more confident in their own abilities "T1-54c I still didn't feel completely on (1) safe ground, even though I've tried it before" and "T1-29 that would require me to have come here many times first to learn it while there was someone".

The reason the participants said they needed more time to feel more confident in the makerspace might be rooted in confidence with the machines. Both with the questionnaire and during the workshop showed that many users are not confident with the machines, e.g. in the pink label 'Learning machines and software takes time, is intimidating, and

some are afraid of ruining them which might inhibit their learning'(See Appendix C), where a lot of the data showed that alone the users were intimidated by the machines. This was brought up during the interview, where some of them agreed that the machines are pretty intimidating, mainly because of how big and complicated they looked, but also because they seem very expensive. In this case it, the participants were scared of ruining the machine.

Additionally, the green post-it "overwhelming, insecure, frustrating" includes several issues and factors that the users seemed to be aware or bothered by, such as the anxiety about the machines, and people feeling anxiety provoked. Some might jump straight into a machine or program confidently, but some might be more hesitant. Some users might be less confident and anxious around the machines, needing more time shown or told how to use the machines. It can be very overwhelming for a person who knows nothing about a makerspace to suddenly must learn about a new program and a new machine, that is not in their normal everyday lives (Kahneman, 2003). "T1-19a if there was someone here who might be afraid of something technical, then I think you could maybe also focus on something else to start with. This can be related to Bandura's (1977, 1993) concept of self-efficacy in the way of the role model. If the role model/facilitator can inspire and guide the users, which can improve their self-efficacy and confidence when using the makerspace. "T1-54f the self-confidence, whereby he trusts that I'll be able to teach, that's also very empowering" Additionally, it can help those who might be less confident in their own abilities, but with the help of a facilitator, that can guide them through it, they can improve their confidence with machines "T1-12b those who might never dream of touching the machine. Here you can, because here is help."

In conclusion, the workshop facilitator played a crucial role in managing participants, setting a conducive learning environment and atmosphere, and nurturing collaborative learning dynamics. However, it is vital to acknowledge the diversity of preferences and

learning styles among makerspace users, as not all individuals may thrive in a structured group setup. Additionally, confidence with machinery and technical tools, a key aspect of makerspace participation, often evolves with personalised guidance, scripts, exposure, and verbal encouragement. Facilitators, thus, play an essential role in fostering such confidence, further underscoring the importance of adapting facilitation styles to individual needs and preferences to promote inclusivity and empowerment in makerspaces.

6.2 Community

The social aspect and community are, and have always been, a big part of a makerspace, this is also the case in Makespace9220, and therefor an important element for us to discuss further.

Atmosphere plays an important role in relation to the social aspect of MakerSpace 9220, both the atmosphere between the users and the objects in the room and the atmosphere between the users and between the users and the facilitator. The atmosphere must be pleasant and welcoming, especially for users that do not come there that often and for new users. From our data, we know that the users feel that MakerSpace 9220 is an inclusive and inviting place because of quotes like “R2-03 It is nice to be here”, “T1-04a at least one word I would use is inviting.”, “R3-06 The Makerspace is fantastic” and “S1-18j Keep up the good vibes”. This form of inviting atmosphere is one of the reasons that make the users come again and, in that way, create and increase the general knowledge of MakerSpace 9220.

Our findings show that the social aspect of being in makerspaces encourages conversations and questions. From our user questionnaire, we know that 59% feel they are included both in the social and a part of the community at MakerSpace 9220, and one of the users said, “S1-19f A fantastic place, especially when you are a bit down”. We know from our literature review that makerspaces communities are a commonly researched

part of the maker movement. Some tried to make makerspaces only for women, which resulted in an 'us versus them' culture (Fox et al., 2015; Smit & Fuchsberger, 2020), which neither they nor we see as a solution. We want Makerspace 9220 to be an inclusive place no matter gender, colour, work situation or other, but as it is now, women might not be included in makerspaces and, therefore, our focus is on them feeling more welcome and safe to use the makerspaces. The place has a creative atmosphere, and as one of our participants said in the interview, "T1-03 There's something for everyone, depending on how you want to be creative". We also know that people visit the place to be creative and create stuff, but they also use MakerSpace 9220 to interact with others and get help if needed. A makerspace is also a place for helping others and getting help, as the Workshop Facilitator describes O1- 07g "Makerspace is a place to come and get help, not a place where others make the things for you".

Creativity and creating are two important words when talking about makerspaces. MakerSpace 9220 is a place for exploring one's creative skills with other users in the community. One of our participants said that it "T1-01b makes me want to go exploring." in the interview, she felt inspired to explore the possibilities of MakerSpace 9220. Here other users might help encourage each other to go explore one's creative skills and be able to help each other with projects. MakerSpace 9220 can therefore work as a creative hub for users to come together and explore creativity.

Research conducted by Lazar et al. (2021) offers valuable insights about introducing retired people to makerspaces. Even though their target group differs from ours, as we primarily focus on women rather than elderly adults, they identify the interests and preferences of their group; activities such as scrapbooking, card making, and jewellery making. This suggests a possible approach to identify what activities or machines might retain women's interests and entice them to makerspaces. It is important to consider diverse

interests when designing inclusive spaces; therefore, understanding the types of creative expressions women find compelling could potentially enhance their engagement and participation in makerspaces.

While Dewey's (1939) theory of experience tells us that an experience has a beginning, middle and end, the communities at makerspaces help to extend the ending and, in that way, extend the experience one has. The findings from our study show that users think it is a good experience to be in MakerSpace 9220 and that it is a place they like to be in and want to visit again. "T1-63 I will 100% come back.", "R3-02 why haven't I been here before.", "S1-19e Nice place good staff and good atmosphere" and "T1-05a I don't think I've had any experiences where I didn't feel welcome" are all examples of this.

As described in the section, one way to improve one's self-efficacy is the way the facilitator acts and helps the users. However, it is not only the facilitator that can raise the users' self-efficacy; it is also the other users. The community can provide a good atmosphere and stand in as role models when the facilitator is not available. Which we saw was a beneficial trait when the facilitator asked P2 to teach what she had just learned to the other participants. This form for cycle of learning is common for the communities at makerspaces and also the case for the community for MakerSpace 9220.

MakerSpace 9220 is a place of chain reaction of learning that leads to self-efficacy. At our workshop, the Workshop Facilitator divided our participants into small groups to collaborate to do their task. Seeing what others have made improves one's self-efficacy in relation to Bandura's (1977) role model and reflecting or observing others. Some of our observations, "O3 – 08a P2 showing how to make stickers on a machine she just learned to use." and "O1-11c P2 now educates the other participants in the sticker machine." show this chain reaction from when the Workshop facilitator shows P2 to use the machine, for her to teach the other participants.

When Makerspae9220 is open, it is an open-door policy where one employee is at work and there to help with the machines. Nevertheless, the users are encouraged to help each other, especially if the one at work is busy helping others. The user feels independence and empowerment when suddenly being the facilitator. As we see in our data gathering, "T1-17b First make your own sticker and then you have to show someone else how to make a sticker and that". These are motivational factors for the user to learn the machines and improve one's skills. Taylor et al. (2016) describe a makerspace as rarely a place just for fabrication but also hubs of communities where people come to work together, learn from each other, and socialise. Another paper from our literature review (Tanenbaum et al., 2013) tells the story of one of their participants, Adrian, that share that he likes to go to hackerspaces, especially when he is missing a tool, needs advice, or to share his knowledge. Adrian mentions that helping others also helps him and makes him improve his skills. We also saw the same in our study, when one of the users said, "S1-19f A fantastic place especially when you are a bit down", pointing out that users might have intrinsic motivations to seek out makerspaces to lift their spirits, in other words, social longing. One of our participants in our interview said, "T1-16 There is room for everyone", and when P2, who was the participant the WF taught to use the sticker machine, said to be "T1-17c able to teach something from you, you really have to be able to understand it yourself".

Additionally, we can discuss the difference between users who work best when working with others and those who prefer to work alone. During the interview, some of them commented this, "T1-28d I would prefer to come here if I have the opportunity to sit in my own little, in my own little world and do something". Some users might want to be able to sit on their own while working, similar to how one works in Art By Me (Cf. Section 5.1.2 Art By Me), where some people thrive from working with others. The different kinds of users they are, depend on many factors, including their inclination towards introverted or extroverted natures, which also affects the community and social longing. If a user is

more on the introverted side, they might want to be part of the social setting in a way of not feeling left out, but they might be too shy or not want to contribute too much to the conversations. Moreover, there might be some users that normally are very social and extroverted but are using the makerspace with the intention of indulging themselves in their own projects, cut off from others. The difference is the motivation that users have for joining, either for the social and community or to be able to work on a project (Einarsson, 2021).

One thing that is important to note is the feeling of inclusiveness and safety when it comes to community. As mentioned in our literature review, often to gain access to expensive digital production tools that makerspaces contain, one has to be connected to some educational institution. In the last couple of years, makerspaces have slowly moved over to become a part of the communal sector and libraries, including more people and democratising the use of makerspaces. Though it seems to have become more available for more diverse groups of people, it also seems that women in particular, are not feeling represented in the community or comfortable. This can be seen in the literature review (Schauer et al., 2022), where the women do not feel as comfortable and included in the community when they are wearing pink safety equipment. As this mainly focuses on if the colouring of safety equipment has an effect on the feeling of being included or set apart in makerspaces based on socially constructed perceptions colour stereotypes, this might not be the best example; however, it does point out the potential factor of being set apart from the group by having attributed placed on one. However, most of our data shows that the users feel included in the social community, and 10 our of 17 of the users who replied were women.

At MakerSpace 9220 there are different objects that are made on the machines exhibited around the room, but it is not clear that the objects are exhibited and not a part of the interior. “M3 – 12a I wish that I could see what other people have created, different areas with signs and examples.” and “S1-18g A few more inspirational projects, possibly pictures of projects made in the makerspace” it is not shown how the objects are made or which machine is used to create this object.

6.3 Visibility

The affinity analysis conducted in this research brings to light another dimension of inquiry: the role of visibility in the overall success and utilisation of the makerspace. It is important to underscore that the visibility factor, which emerged as a recurring theme, is multifaceted, encompassing three distinct yet interrelated dimensions.

We could possibly imagine the journey to MakerSpace 9220 as an experience (Dewey, 1934). There should be a beginning, a sense of noticing the existence; a middle, such as entering and roaming the room, possibly partaking in the activities; and an end, leaving the makerspace with a feeling of having had a complete and emotionally satisfying experience. The journey that in this section would be interesting to investigate, is the beginning, as it was this part that we found lacked the users notice. In the sense of them not being aware of it existing. Which then would disrupt the rest of the intended journey.

Ultimately, the easiest way of remedying the largest flaw of entering the makerspace, would be to keep the area of the stairs clear of clutter. Based on both our own observations “M2-09b Easy to overlook the entrance” and that of our participants’ “T1-37a maybe don’t put all your mess right where it’s supposed to be one-one”. Where this one obstacle was a tremendous barrier for us and them to notice of feel welcomed into the space. When cluttered, it signals to visitors that this is a private area for staff and not intended for visitors. Additionally, users might not feel motivated to enter. The entrance

is therefore very important for the user's motivation to use and enter MakerSpace 9220. In both our questionaries, the users and the participants did not express their motivation of the entrance. The way that users had gained an introduction of MakerSpace 9220 was mainly through other people or via social media, meaning that none of them found out about makerspace through merely visiting Trekanten. Moreover, almost all the participants had not prior knowledge of MakerSpace 9220, but most of them knew of Trekanten. Which can point to the fact that the visibility of MakerSpace 9220 in Trekanten is lacking and that there is a somewhat lacking connection between the two sections. This can have something to do with the entrance, as it is not visible for the users of Trekanten.

Firstly, we discussed the physical visibility of entering MakerSpace 9220. Our first observations tended toward signifiers such as messy, unclear signage, hidden or difficult-to-find posters, and general ignorance of the existence of the makerspace in the basement of Trekanten.

For a makerspace to thrive, it needs to be easily accessible and noticeable. The entrance, for instance, can serve as a vantage point to increase the makerspace's visibility. By introducing conspicuous signage, posters, and layout diagrams at strategic locations, not just at the entrance but also within the interior space of Trekanten, visitors can be guided and attracted towards the makerspace. Such design measures can significantly alleviate navigational challenges and optimise space utilisation, thereby improving the overall user experience.

Here changing the physicality of the entrance to the makerspace, would possibly change their attention and sense of noticing. Which in that case could be where they could shift the focus in a focus on a more inviting atmosphere (Böhme, 1993). Meaning that it would interrupt their script (Schank & Abelson, 1977) and norms (Kahneman, 2003), in a positive way. By this, the daily user might have a script that only is focused on the objective

of going to Trekanten, but when arriving there, they have a diversion in their script, which leads them to a possible new script, and possibly a new norm, if they further want to keep coming back to the makerspace.

Though we mentioned that the users in our questionnaire did not find the entrance to their liking. We also can see from the user questionnaire, that 6 out of 17 mean that the entrance is easy to find, and 7 out 17 that find the sign to the basement is clear. We are with this assuming that the 7 and 6 users, were somewhat the same ones. Even though those 7 users find the entrance easy to locate and the signage to the basement clear, the majority of users still point to either disagreeing or are uncertain. Either way we are also taking our own observations and the participants opinion on the entrance. Which as mentioned above are stating that the entrance is lacking visibility.

Not only is it an important that the entrance is visible for potential users, but additionally is it important to start democratising the utility of the makerspace (Tanenbaum et al., 2013). That means that it would be beneficial to show the machines to the users in such a way that they know that the machines are not a challenge but that there is helping to get. This could be done by showcasing what is possible in the makerspace and give the users of Trekanten an insight into how the learning curve is. Either way, having a sort of presentation of some of the products that have been created at MakerSpace 9220, by the entrance, would not only guide then towards the space, but it could bring more people the motivation to go there.

Another element of visibility is having a form of memorabilia from MakerSpace 9220 and Trekanten. This could either be by showing some things that people can make and take home after visiting the makerspace. This was something that the participants had expressed during the workshop, “R3-04 good to get something to take home”. This also related to motivation, in forms of extrinsic motivation, where users can become more

motivated of the thought that they are getting a thing with them home. Some of the ideas of improvements from the users questionnaire was to further expand upon the idea of memorabilia. With this some of the users express the need for; “S1-18k Distribution of products made on site”, insinuating that Trekanten could sell small tokens of MakerSpace 9220, which could potentially expand the visibility to potential users. Additionally, they could showcase more of the creation around in Trekanten, this could be either with cups in the Café or art on the wall. Similarly, to how Art By Me are using cups in their café made in their shop. This could potentially set a reminder for the guests who have taken items they created home and items created at the makerspace and sold in the café as indirect marketing and drawing more attention to the existence of MakerSpace 9220.

If this then is the main source from where the users get to know MakerSpace 9220, it is interesting to see what otherwise should be done to improve the visibility of MakerSpace 9220.

Some of the users mention that Trekanten and MakerSpace 9220 needs more exposure and better advertisement to improve the visibility. This could include both social media exposure or physical advertisement of sorts. It relates closely to the fact that many people in Aalborg have no idea that makerpsace9220 exist, many might know of Trekanten, but have no knowledge of the makerspace. Therefore, exposure in forms of better advertisement might be something that would be interesting to work further on in our proposal.

Given that we had looked into other places like Art By Me. We also recognised that they seem to be very visible to the people in Aalborg and one of the reasons why is their approach to advertisement and exposure. Here Art By Me Instagram is a great example of good advertisement, where they show of users own creations and pieces. This can attract more users and motivate them to try and create something similar.

Visibility is therefore also a big part of motivation, not only the physical visibility, but also the visibility with through marketing. Visual cues in forms of a social media post, in the same ways as Art By Me, might increase more peoples self-motivation and increase their intrinsic motivation, by showing things that they can create in MakerSpace 9220 which will interest users to visit and make some similar things for their own sake (Ryan & Deci, 2000).

With the newer users there is also the chance that some of them are in need of an introduction. Therefore, another way of motivating more user to join, is to show accessible events that they can get an introduction to the workshop. Our own workshop is a good example of how it introduced possible new users. Most of the participants was interested in going more to the makerspace, and many of them were pleasantly surprised of the things one could do in such a space "T1-11c You just think wow. Yeah. I'd like to go there again". Workshops are therefore also a good way of becoming more visible to more users. MakerSpace 9220 would need to hold more introduction workshops, but also advertise in a way that would attract more diverse user. Given that the social media that they have now is mainly showing the machines, where showing them some things that they could make might motivate more diverse groups.

Another discussion point that we can relate to the visibility aspect is that many of the participants had limited or no prior knowledge of the existence of MakerSpace 9220. With the data from the workshop questionnaire, we could see that most of the participants have never been to MakerSpace 9220 and more importantly many of them did not know what a makerspace was, until they were at the workshop, but most of them had been to Trekanten. We found this interesting, because if they have visited before but had no knowledge of the makerspace, then it might be rooted in the fact that none of them had seen any visible signs of a makerspace. This could very much be related to what we had observed in our initial observation. That the entrance was unclear to see.

If the physical visibility of MakerSpace 9220 is lacking, then how do users find the place? Many of the users that were asked about this in the user questionnaire, said that they have learned of MakerSpace 9220 through word of mouth, either from a friend, family, or another acquaintance. Besides word of mouth there is also a few that had heard of it through an add or if they had visited with relation to a school visit.

A discussion point that we have not yet touched upon is the visibility of more diverse genders. With this we are talking about the physical representation of females in Makerspaces. One thing that was discussed during the interview, was when one of the participants asked how many women are working in Makersper9220, where then one of us responded with "T1-60 Also historically, there hasn't been a woman so far who has worked like this." Which then made the participant asking annoyed of the fact of it. To then have more representation of more women, would it make a difference to attract more women? To this we have a couple of points. First of P2 had mentioned that in the beginning of the workshop she had wondered why we had not chosen a woman to lead the workshop, but when he then started to facilitate it made no difference at all, whether it had been a woman instead. But even if the gender of the facilitator does not matter when in the makerspace, it might still matter for the becoming motivated to join in the first place. If there instead they knew that it would be a women facilitator, then some potential users might think, "if she can do it, then so can I", and in that way become more motivated to join.

6.4 Gender inclusivity

There are several discussion points on the gender inclusivity aspect, generally we are looking at some of the things that we have gone through in the prior sections of this chapter. Though this section will further explore some of the data and insights that we relate more to gender inclusivity.

Firstly, we can discuss whether the facilitator role affects gender inclusivity. Here we can say, as discussed in the prior section, that for some users it will not make a difference whether the facilitator is a man or woman. In many cases it is the way the facilitator is leading the makerspace and facilitating, that has an impact, and, in other instances, it could be that the facilitator might treat the users differently based on their gender Instead, we have more insights into the users experience with the facilitator. Where we can discuss if the difference between a workshop being led by a man is a different experience than one lead by a woman. Initially we would assume that it would not be different, according to P2´s comment, ”T1-18 then he was just so, super nice and lovely. That it made no difference so very quickly”, though does it not only effect the visibility of women in a broader sense, but in some cases, it can be a motivation for many women who want to join. This means that when we mention that we want more women as facilitators, it is not because we think that men are not capable to facilitate other genders than men, on the contrary, it is more about the representation of women in makerspaces and having someone similar to reflect in.

The representation or visibility of women in makerspace, is something that we touched upon in previous sections. But in this section, we are looking at this with the lenses of gender inclusivity, rather than visibility. Given that there generally is a lack of representation of women in makerspaces, it is prevalent to find ways to better this problem. This could as be mentioned previously in various ways, either be by the visual cues in forms of more pictures of women in and around MakerSpace 9220. This could improve the experience women have of MakerSpace 9220. When seeing more representation of them womenin Trekanten and the makerspace, it can improve the community feeling, for and make them feel more included in the space. It can in some ways also help improve their self-efficacy (Cf. self-efficacy by seeing other women, they can relate to them, and they might feel more confident in their own abilities. This would also potentially motivate them to involve themselves in the creativity and be inspired.

Women's motivation is not only something that can be affected by the representation of other women in the makerspace, but it is also something that has to do with their own experience. If they for e.g., have never heard of a makerspace before, like some of the participants from our workshop, then it might take various elements to motivate them to join. With this meaning that some users might relate more to what makerspace's are made for, and enjoy the thrill of crafting, creating or technology. But other people might not take interest in those kinds of things, and therefore will less likely feel motivated. This means that we of course cannot motivate everyone to join, but we can focus on trying to motivate more women, both with intrinsic and extinctic motivations, by increasing visibility, and have more representation of women in MakerSpace 9220. Women's' prior experience in related places might also affect whether they are motivated to join.

Women's' experience with makerspaces can affect much with wanting to join. First, if they have had prior experiences in a makerspace that too many bad things happened multiple time, they will have created a norm that labels it as an experience they do not want to have again (Kahneman & Miller, 1986). Let us imagine a scenario using script to explain this. If they have chosen to start a makerspace script, that includes them wanting to make a nametag using a laser cutter, but their script was disrupted in various ways. By firstly having a script break when they do not know how to use the program, this can divert their script shortly, when they then are trying to get help from the facilitator. But if the facilitator does not help the user and dismisses them to help someone else, the user can feel neglected by the facilitator. If this happens multiple times by both a facilitator and other users, then over time the user might end up stopping that script, and not want to try again (Schank & Abelson, 1977). This could also be the same for any other gender who experiences a similar situation.

If one looks at it from a gendered perspective, it can be other instances, either a person or an object that can specifically affect more women than men. For instance, having lower

self-efficacy when it comes to using the machines, can give women a worse experience, if not helped, as they already have a preconceived opinion on not being able to use the machines. If they are approved in their fear of machines and not proven wrong by showing that it is possible, they are more likely not to feel motivated to come back. With our study, it did not seem like that was anything that users at Makerpace9220 experienced.

Most of the women, seemed to have a pleasant experience "R2-01 Super good introductory tasks that give you a good knowledge of the makerspace and the different possibilities it offers". Though there were some of them that expressed lack of confidence with using the machines. Given that we only know how their experience was in a workshop with mainly women, we cannot assume that it would be the same experience under other circumstances. This was one flaw in our research, that we did not observe the space and participants during a usual day. One of our participants speculated, that they would not have been as sure in their self-efficacy without the introduction they gained in our workshop, and that the experience of entering the makerspace on a regular they might have been similar or completely different, leading her possibly not feeling as 'taken care of' as they did during the workshop. "T1-05c I now have an introduction, which I have received, and I'm not sure I would have had that the first time I came, where I hadn't known anything about the machines". Not executing the same workshop with a mixed gender group, leads to loss of potentially valuable insight into this discussion. However, we can through taking other studies and our questionnaire into account, cover this speculation in part and reflect on how a mixed gender workshop could have resulted in different insight. Alternatively, it might not have affected the results at all.

Another key point to discuss surfaced around the potential influence of a gendered perspective on interior design and its subsequent impact on women's experiences within a space. We draw attention to how the aesthetics of a room, when primarily conceived from a male perspective, might not resonate with or inspire women. This observation raises

concerns about potential gender biases in space design. Citing Eckhardt et al. (2021, p.3), “if interior design and the educational offer are implemented by males, this could result in a lack of spaces and offers that are attractive for females”. This suggests that the predominance of men in interior design and the crafting of educational offerings could lead to a lack of spaces and services appealing to women, thus creating a sense of exclusion. However, we also highlight an important gap Eckhardt et al.’s (2021) work; while the authors discuss the issue of male-oriented designs potentially being unwelcoming for women, they do not elaborate on the underlying reasons. This leaves open the question of whether it is a specific atmosphere or other intangible elements that men might unintentionally incorporate into the space, affecting its inclusiveness.

The representation in the interior of MakerSpace 9220 is another point that could improve the representation of women. This was mainly because we observed several things about the makerspace that could impact the user’s experience. The descriptions of the room were often contradictory in many ways. E.g., the blue note; ‘The room is messy, cluttered and sometimes seems unmanageable’. This was rooted in many of our personal observations, we saw that there was a dichotomy in the room being organised, but also that it felt messy. However, when it came to the participants' comments on the room, most of them seemed positive and described it as futuristic and a mix between modern and craftsmanship. Given that our own observations of the room were not reciprocated by the participants, we later, as described in chapter (new problem area), that we changed the problem area from looking at the space as some part of the problem, to looking at other aspects. Though we had somewhat changed the course, we still felt that the interior of the room had a certain importance to the experience. This could come from the theory of atmosphere, where Böhme explains the importance of aesthetics and atmosphere. Whether that theory could help explain how our initial observation of the room seemed to be less positive, because we were mainly looking at the objects within the room. When we first experience MakerSpace 9220, we saw it out of context and without using the things in the

room. The participants have had the opportunity to try things and explore more things. Moreover, they had a very different experience than we had, which could affect how they viewed the room, as they related to the positive impression that it has left. Moreover, this can also be related to atmosphere regarding the social aspect, as mentioned earlier, the other people in the room can affect the users experience, and therefore also their experience of the room.

"One significant element that makerspaces describe themselves as, is that they all try to be an inclusive space, where anyone can join and learn new skills, or use their public equipment for personal projects." (Einarsson, 2021, p.). However, what are the specific things that they do to be more inclusive and why is it then that there is a lack of diversity in gender in makerspaces? Even though many newer makerspaces have tried to label themselves as inclusive, it might not be true, as several elements point to that they are not as inclusive. Many of them might not even realise that they are not as inclusive. This leads us to how other initiative have tried make the makerspaces more inclusive E.g., involving the concept of 'Maker Bubbles'. This refers to the feminist hackerspace communities as their solution to acknowledging women in the maker movement. Though this solution finds a way to include more women, it often leads to a separation of communities. So instead of including women in the already existing makerspaces, this would further separate them from the community (Smit & Fuchsberger, 2020).

But how much knowledge do the regulars of MakerSpace 9220 have of this distribution of gender, and what do women feel about it? We looked for answers on this by asking the regulars, where most of them, 58,8%, are unaware of it. This is somewhat concerning as they might have the impression that it is not a problem, and therefore have no motivation to do anything about it. But when we asked them if they thought that there were fewer women than men, many of them agreed with this, which means that many of them had noticed the distribution. Additionally, when the participants of the workshop where told

about the gender distribution, many felt terrible about it. Where they expressed a sense of anger and sadness, followed by several examples they had experienced. The examples expressed how they have felt overlooked by men, “T1-61 Even if I’m standing down here and there are maybe three of us down here, and it’s two men and me, they turn to the others first”. This can in many ways be why many women feel less motivated to join the mix gender makerspaces. Though during the gender conversation some of the participants expressed that the conversation made them want to change the numbers and motivate them to join. Additionally, some of them express that many women have the will power and motivation to join, but due to society norms do not believe in them, “T1-57b it’s not because the women can’t or don’t want to or think they can’t. It’s because there are some others who think they can’t.”. Even though this might be one very important rooted reason for why some women do not join, it is by no chance the only reason. As we also know that we have mentioned several other reasons. Though this is a very rooted reason, it tells us that many women might think that society's norms are the norms to follow, and therefore they are not meant to join MakerSpace 9220.

6.5 Part Conclusion

The core themes that emerged from our discussion, the role of the facilitator, the importance of community, the facets of visibility, and the notion of gender inclusivity, provide us with a comprehensive understanding of the dynamics within MakerSpace 9220 and makerspaces in general. These findings underline the fact that improving women's experience and participation in these spaces is a multifaceted challenge, calling for concerted and collective efforts.

The facilitator's role emerged as pivotal, extending beyond mere instruction and supervision to fostering an atmosphere of inclusivity and warmth. On the other hand, a strong sense of community, nurtured through shared knowledge, collaboration, and strengthening of social bonds, can make the space more welcoming and appealing to all users,

especially women. Visibility, examined from three different angles, women within the space, physical visibility of the space, and visibility of creative and commercial efforts, also came forth as a decisive factor in shaping the user experience. Lastly, gender inclusivity, signifying an environment where everyone feels acknowledged, welcomed, and included, underlines the ethos of what a makerspace should aspire to be.

These insights collectively serve as a robust foundation for developing actionable strategies to enhance women's participation and experience in makerspaces. However, it is crucial to remember that these elements are not silos functioning independently. They are intrinsically interwoven, each playing a role in influencing and reinforcing the other, shaping the collective experience of the makerspace.

With these understandings, we are better equipped to address the underrepresentation of women in makerspaces. Let us now transition to the proposal chapter of this thesis, where we will outline specific interventions drawn from our findings and discussions. These proposals aim at reinforcing each of these aspects; facilitator's role, community, visibility, and gender inclusivity, to build a more inclusive and empowering environment within MakerSpace 9220, thereby fostering a larger, more diverse, and enriched community of learners.

7. Proposal

7. Proposal

This chapter takes points of departure in the findings from our study and provides details on the actual process we undertook in order to generate ideas and propose initiatives for Trekanten to consider, aiming to increase accessibility, visibility and the inclusivity of women in MakerSpace9220. Building on our discussion in the previous chapter, this chapter begins by outlining four different exercises that aim to generate ideas. The first session was inspired by the technique called brain sketching (Van Der Lugt, 2002). This method is a different approach than brainstorming, as it uses drawing a sketching instead of words. The second round of generating ideas consisted of a normal brainstorming session where everyone would write down as many ideas as possible on Post-its notes. The third round was the same type of brainstorming, but with a constraint. This constraint was that one would have to write down the ideas but from the point of view of a specific job title. The last and final round would then consist of us gathering the three previous sessions' ideas onto a wall, to assess their potential value for MakerSpace 9220, in our opinion.

7.1 Idea generation

As we mentioned in the previous section, we initiated the generating of ideas, by using brain sketching as a means to record our ideas through sketching and drawing. During the brain sketching, we individually sketch out ideas, which linked back to our analysis session. After a few minutes, we switch places and then continue on another persons' sketches. This will continuate for several rounds, resulting in a sketch that everyone have contributed to (Van Der Lugt, 2002).

When we went through this process, we chose to use two minutes on each round as we felt it would be most beneficial to us to limit the time. Additionally, as we were three people doing the exercise, we had to go at least with three rounds. But here we wanted to add a few extra rounds as we felt we needed them, to be able to further develop on

some of the ideas'. When finished with the last round of sketching, we used some time on discussing the outcome of the three drawings. Here we had unintentionally created somewhat similar sketches, in how each of them have focuses on events. E.g. a cocktail night as an event, where user could join that event, at Makerspace 9220, to learn skills while drinking (see figure xx), a karaoke event, where, users could learn how to use the machines through music and rhymes (see figure xx) or a artistic lightshow event, where users learn while experiencing a lightshow (see figure xx).

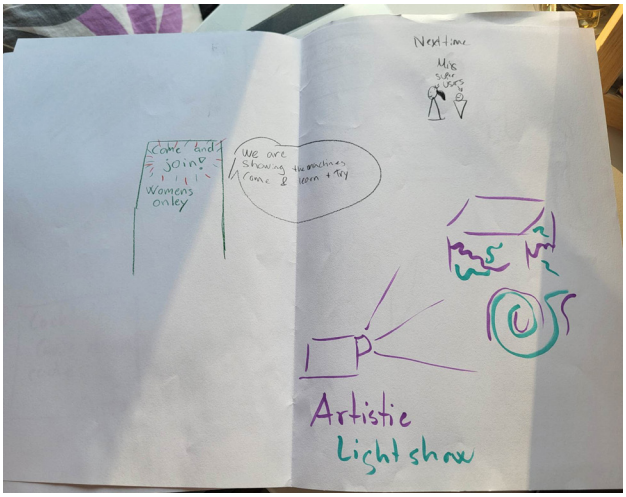


Figure 34 Idea of events such as cocktail night (Own Picture)

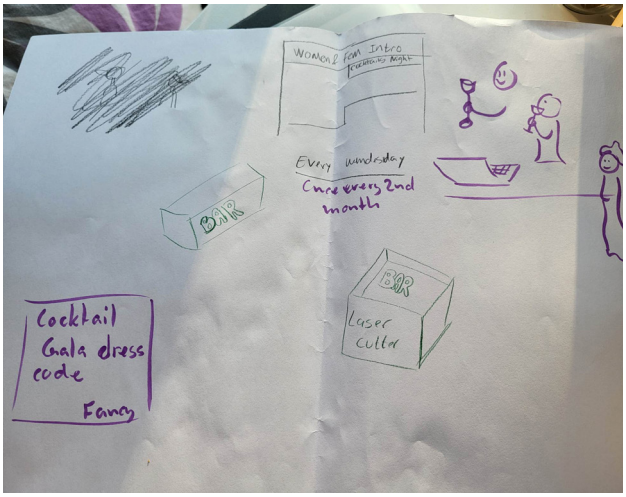


Figure 35 Idea of karaoke events or learning though singing and rhymes (Own Picture)

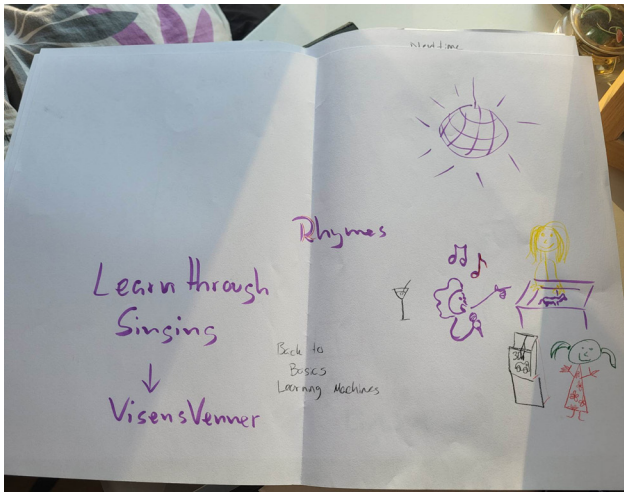


Figure 36 Idea of artistic light show to affect the atmosphere during learning (Own Picture)

After the first session we introduced small minigames inbetween the activities to activate the researchers and raise their energy levels, to keep the creativity flow going. One of the minigames we introduced was were we had to name a theme, and take turns to name a corraspondign thing. When a mistake would occur everyone all would yell “Yes! We made a mistake!”. We did this seveal times, in order to challenge our brains.

After the minigames, we went back to the brainstormning session with a fresh perspective. This time we used a brainstorming session where the goal was to get as many ideas as possible down on post-its. Similarly to when brain sketching, our itterated problem statement and our analysis in mind. We made it optional whether we wanted to write, draw or both to visualise our ideas, as long as they could fit on a post-it. We sat the timer to a few minutes, and when the time was up, we took the post-its and hung them on a board. We reassed and discussed which of the ideas that we found most realistic. We took some time to look at each other’s ideas, and then talked about them and explained if something was not clear. If some of the ideas were similar, we grouped them. At the same time we also voted on the best idea of this idea generation round, by all having three votes.

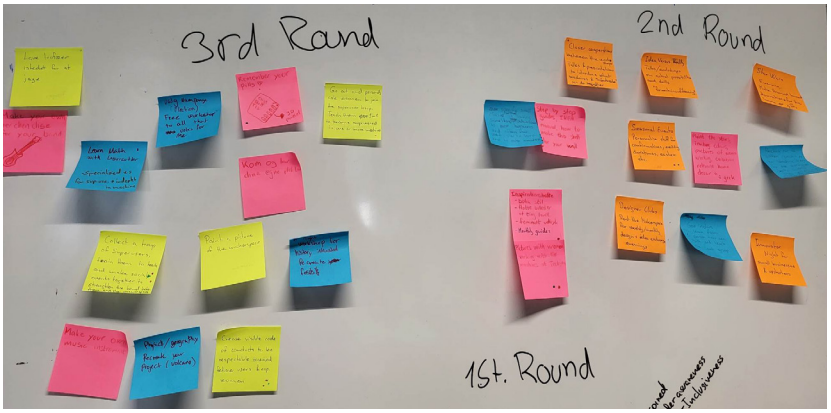


Figure 37 Overview and example of dot-voting (Own Picture)

Some of the ideas were similar, such as organising thematic events such as Star Wars and weddings. The idea is to focus on making objects for specific themes and not focusing on the machines. Other ideas that came up were as follows: (1) to paint the stairs to Makerspace in invition colours, and hang pictures of women working in the space and display relevant home décor; (2) to have talks and workshops on what is possible to make, like reconciliation of expectations of what is possible to make and what can be done differently so that the object becomes possible to make; (3) to make step by step guidelines on how to make specific things, focusing on the things that one can make and not on the machines. This idea we composite with an idea regarding small classes/workshops where the participants should make something specific and advertise to beginners; (4) to make an inspirational booklet with beautiful and appealing pictures looking like interior magazines; (5) to hang pictures with women working in Makerspace9220 around in Trekanten; (6) designerclubs which could rent Makerspace9220 to specifically meet to design, develop, and idea exhange in weekly or monthly evenings; (7) to have one person that can guide and teach one small group; (8) to host innovator nights for small businesses and upstarts, where they could meet to discuss possibilities; and (9) the last idea was a to reach out to women communities and introduce them to a specific workshops with one particular thing to produce.

For the next round of idea generating. We took inspiration from an exercise from Ullersted et al.(2010), and wrote down different kinds of jobs, such as doctor, fighter pilot, hunter, mathematician and so on. Then we each got a jobtitle, and then did a brainstorming activity with the following expression: “if I had this kind of job, how would my soloutin to the problem statement be?”. This was to change our perspectives from something did not have anything to do with women, STEM, makerspaces or themes from our problem area. By chaning our perspective, we could potentially be ‘forced’ to view the problem from an alernative angle.

In instances were we would run out of ideas for the job in question, we could take a new job title to use instead. When the time was up, we hung our ideas on a board for everyone to see where we afterwards explained the different ideas to eachother. Again the members had three votes each, to assess and discuss them further.

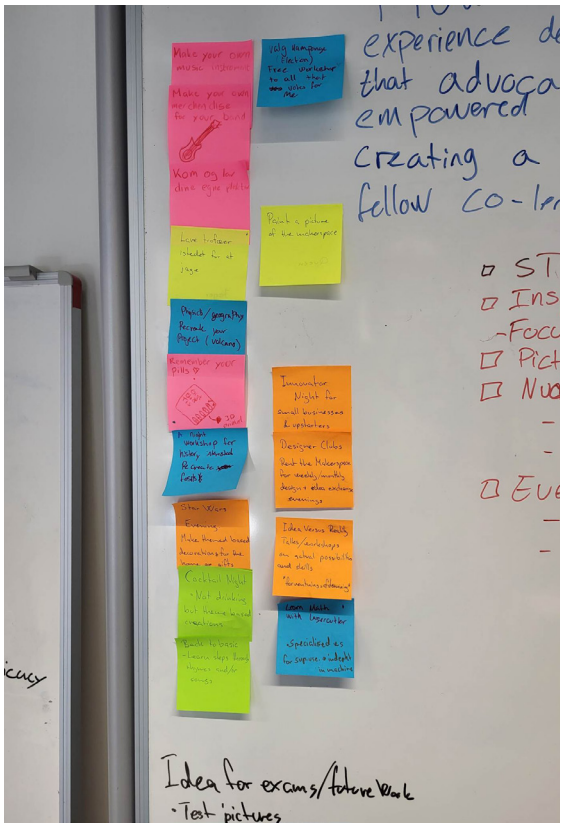


Figure 38 Ideas sorted into listed piles according to themes and similarity (Own Picture)

Some of the ideas gained from this idea generation were events where the users could come and make specific products, e.g make your own guitar pick, analog pill checklist to remember your medicine, make merchandice for your band, make hunting trophies, recreate fossils or make your own music instrument.

Some of the other ideas were more closely related to our discussion keypoints. E.g to go out and personally ask women to join the ‘superuser troup’ and then teach them one on one to become empowered in one or more machines. To learn math with the laser-

cutter, where the participants will learn how to operate one machine. To collect a troup of superusers, train them to teach others and organisee social events to strenghten the bond between them and Makerspace9220. And to create visible codes of conducts to be respectable towards fellow users and especially women users.

During this exercise, we found it challenging to not become repetitive in our ideas, therefore we will in the following section go through our discussion of these ideas and how they relate to our findings and could be potentinal initiatives for MakerSpace 9220.

7.2 Discussion of Ideas

After the three rounds of idea generation, we discussed all our ideas in relation to our analysis of our findings in our study. We ended up with a few ideas that we did not find useful to work further with, because some of them were too narrow, e.g., very theme-based events or specific products to make. The overall idea of having theme-based workshops, or workshop where the participants had to make one specific product and thereby learn how to use the machines, is still on going. Other ideas we found irrelevant was when it correlated with Trekanten and MakerSpace 9220's actual resources, and when some of the ideas were not possible to make while others were strange, unconstructed, or unrealistic.

Through our creation rounds and discussions, we ended up identifying four keywords: 'visibility', 'self-efficacy', 'inclusiveness' and 'comfort'. Visibility' originates from memorabilia, making the entrance to Makerspace9220 more noticeable and creating awareness of Makerspace9220. The word 'self-efficacy' is focusing on improving one's belief in own capabilities. 'Inclusiveness' relates to Makerspace9220 as an inclusive place for both men and women and all in between – that is, more inclusive than it already is. 'Inclusive' does not mean that any of the ideas are non-inclusive, it means that some of the ideas are more inclusive than others. We see 'comfort' as a mixture between security, safety and feeling comfortable.

These four words can be seen as guidance, if in which the ideas would fit, they could be used as a possible solution.

To make our ideas visual and to evaluate them, we made a diagram with the four key words on a blackboard and distributed our post-its'.

The diagram gave us areas with almost every combination with one, two, three or all four words. The only combination missing is the combination with the two words standing opposite each other. We tried to find the word of opposites from each other. Within 'visibility' opposite 'comfort', and 'inclusiveness' across for 'self-efficacy'. We had the opportunity, if needed, to make areas for the combination of two words across each other, but we never needed it. We tried to make it into a spectrum and not a scale, meaning that it has meaning where in the area the post-it' is put – so if the post-it' is closer to other areas it is intentional.

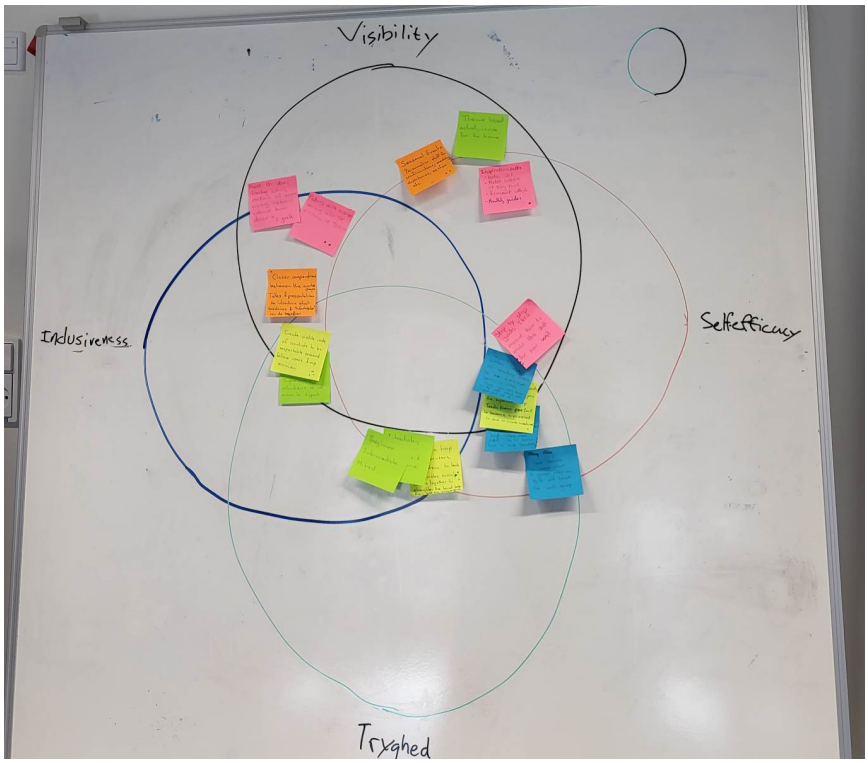


Figure 39 Brainstorming: Ideas sorted into listed piles according to themes and similarity (Own Picture)

In this area of the diagram there are two ideas, the one being seasonal events for making personalised items for confirmations, weddings, Christmas, Easter, etc. This idea is fit within the visual area, because it is a form for marketing event to spread awareness about Makerspace by inviting people to different workshops according to the seasons. The other idea in this area is similar, a marketing workshop but this time with the aim of making one or two specific products, making it manageable for the user to get to know Makerspace9220, because there is one predefined specific task. The similarity in the two ideas is that the focus is on the end product and not on the machines.

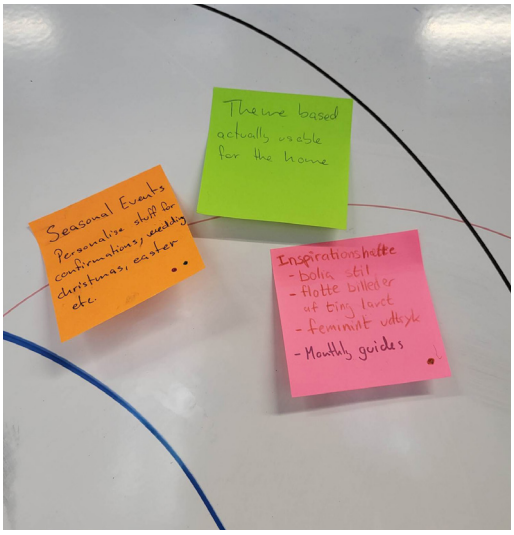


Figure 40 Ideas sorted on Diagram related to only Visibility (Own Picture)

In this area we have two post-its. The first one being in the top, close to the visibility and self-efficacy area, is an idea with an inspiration booklet with pretty pictures of objects that can be made in Makerspace9220. This inspiration booklet should express a feminine style. The other idea is in the bottom of the area, closer to the area of visibility, self-efficacy and 'comfort', and is an idea with a step-by-step guide on how to make one specific object, for example to learn to make this shelf. This guide could both be online or be in Makerspace; the point is that it should be a guide with steps like an IKEA assemble guide. These two ideas are visual, but also contribute to the user's self-efficacy due to the fact that the users can learn in their own pace building up their self-efficacy.

In this area there are three post-its'. The first one being an idea of reaching out to pre-existing women communities and introduce them to Makerspace9220 by offering workshops only for them. In these workshops it should be a specific object they should make. The second idea is to go out and ask women to join the superuser troop and teach them one on one to learn to use one or more machines, so they would get to know them and become empowered. The third idea is to create small workshops where the participants should make one specific object. The workshop should be advertised to new users and others that want to learn to make this specific object. These three ideas have the following in common: they are all events with small groups of people, so the users do not feel overwhelmed by participating in the events. The three ideas are in this area, because the event should be a safe and comfortable space for the new users to learn to use the machines without being overwhelmed by the more experienced users and for improving the new user's self-efficacy, but also because the events are there to create more visibility for Makerspace9220 by event marketing.

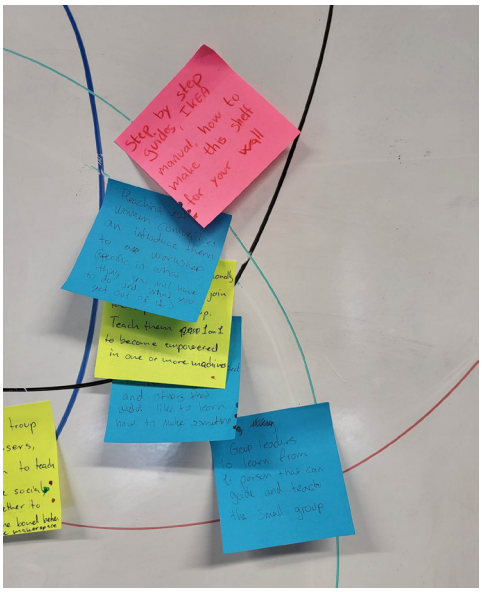


Figure 41 Ideas sorted on Diagram related to Self-Efficacy, Comfort and Inclusiveness (Own Picture)

In this area there is only one post-it'. The idea is to give each superuser a small group of new users, so the new users have one mentor they can go to and get help. This is not in the area with visibility because it does not increase the knowledge of Makerspace9220.

There are three post-it's in this area. The first one is to categorize the users into beginner, intermediate and mixed groups. The second idea is that new users should go through beginners' courses 2-5 times before they can become a regular user. The third and last idea is to collect a troop of superusers and train them to teach and make social events together. In that way it would strengthen the bond between the superusers and Makerspace9220. These three ideas have that in common that they give the new users a structured and new start at Makerspace9220 and are placed in this area because it is not something that directly increases the knowledge and visibility of Makerspace9220, but it creates a safe and comfortable place for the users, and it increases the users belief in themselves by letting them slowly and steadily get to know how to use the machines.

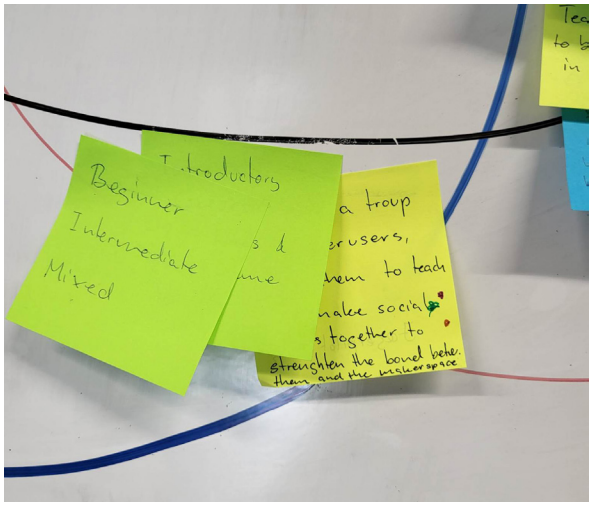


Figure 42 Ideas sorted on Diagram related to Comfort, Inclusiveness and Visibility (Own Picture)

In this area there are two post-its. The first one with the idea to create a visual code of conduct of how to be respectable toward fellow users and especially women. The other idea is to create events with mixed users, both new and super, where the superusers would volunteer to support the employee at Makerspace9220. Both of these ideas are to create a safe place for everyone and to spread the awareness of Makerspace9220.

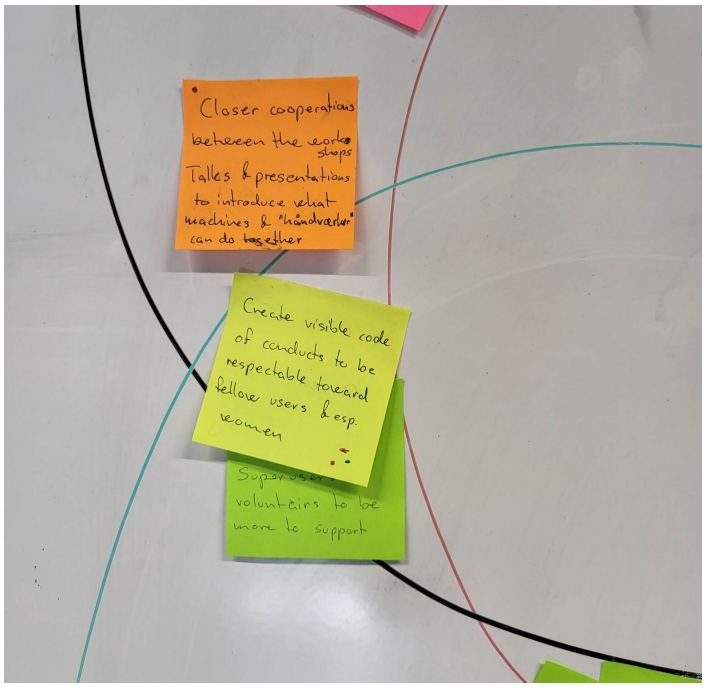


Figure 43 Ideas sorted on Diagram related to Inclusiveness and Visibility (Own Picture)

In this area there are three post-its that are spread across all of the area. The one, which is located in the middle is an idea of a closer cooperation between the open workshops Makerspace9220 has in advance with talks and presentations that introduce what the machines and the craftsman can do together. The second idea is close to the visibility area, and the concept is to have pictures women working with the machines and to hang them around in both Trekanten and Makerspace9220. The last idea is on the line between the area of inclusiveness and visibility and the area of visibility. This idea is to paint the staircase to the basement where Makerspace is, in a new and inviting colour so the basement does not look like a place only for storage and staff. This idea also includes organising exhibitions of objects that can be made in Makerspace9220 and to have pictures of women working in Makerspace9220. The two ideas placed close to the area of only visibility are small improvements that improve the visibility of Makerspace9220 v for the users in Trekanten, but one has to come there to get exposed to the visibility. The other idea is more an event marketing where talks and presentations can improve the knowledge of Makerspace9220.

None of our ideas had all of the four words and got placed in the middle of the diagram. It does not mean that the ideas are useless, but rather that we should combine them.

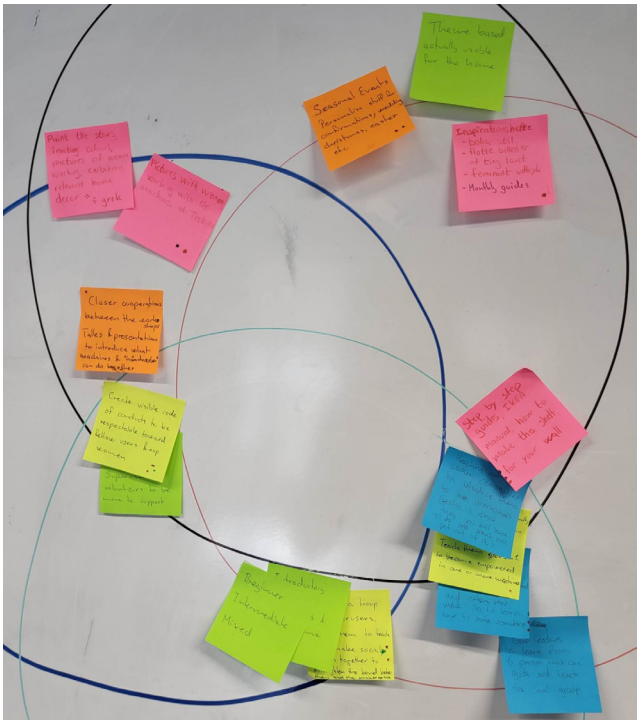


Figure 44 Ideas sorted on Diagram related to Visibility, Self-efficacy, Comfort and Inclusiveness (Own Picture)

7.3 The Five Proposals

To make the ideas clearer and more specific, we combined them into five ideas. The next part will be a description of these five concepts.

7.3.1 Step-by-step guidelines

The step-by-step guide can be an ad-on to a workshop being held in Makerspace9220. The step-by-step guide must be simple and not a video but pictures with a short explanatory text. As it is now, Makerspace9220 has a playlist on YouTube with tutorial videos others have made that Makerspace9220 endorses. We discussed whether the step-by-step guide should be online for everyone to see, online but for the users of Makerspace9220 only or be physical in Makerspace9220s rooms in Trekanten. The advantages of having the guide online would be that it reaches out to more people, not only the ones in Makerspace9220 but also the rest of Denmark or the world depending on the language. Another advantage of having the guide online is that the users can sit at home and prepare, making the drawings on their computer, before they go to Makerspace9220 and produce it. The disadvantages by the users sitting at home are that they are not present at Makerspace9220 and can help other users; this can be a reduction of the community and to the time the users spend at Makerspace9220. Another disadvantage is also that if they get stuck and the step-by-step guide does not help them, there is no one to consult them.

7.3.2 Inspiration booklet

The inspiration booklet is different than the step-by-step guide by being for inspiration only. The booklet should focus on the products that can be made at Makerspace9220 and not on the machines. The design of the booklet should be feminine and Nordic, with light colours and focus on products that women want to have in their own home. We discussed whether the inspiration booklet should be online or printed, where the advantage of an online booklet is that the users can sit at home and be inspired by which things, they can make in Makerspace9220, while the disadvantages are that the users then would not be present in Makerspace9220. This idea would be an easy and relativity cheap booklet to

make, and the users can make it themselves and print it in Makerspace9220 but standing alone, they would not get more women to use Makerspace9220. This idea has drawn inspiration from Art By Me's Instagram where their pictures, stories and reals are one big online inspirational booklet.

7.3.3 Pictures of women working in Makerspace9220

The idea of pictures of women working in Makerspace9220 originates from (BOSS-LADIES, n.d.) where they on their webpages have a gallery with women working in construction, the maritime professions and the industrial professions. When looking at Makerspace9220 webpage (MakerSpace 9220 | En del af Trekanten, n.d.) there are not many pictures, and those pictures with people on, only depict men. This idea has the aim of creating awareness about the notable absence of women. With the theory of Self-efficacy (Bandura, 1977, 1993) in mind, that seeing others one can compare oneself to, it would increase potential female participants' self-efficacy and bring forth the message that if she can use the machines, so can I. The pictures could also be used for advertising and social media, in that way it would not only be the visitors in Trekanten that would be inspired to visit Makerspace9220.

7.3.4 Nudging entrance

As it is now, the entrance to Makerspace9220 is white and it does not look like a place where visitors at Trekanten are allowed to go, it looks more like a storage space only for the employees. Furthermore, the entrance does not indicate that it is the entrance to Makerspace9220. Also, in Makerspace9220 there are some objects that are made in their machines, but it is not always clear that it is an exhibition and that the objects can be made there. Therefor one idea is to freshen the paint and interior decorations, e.g., with pictures and exhibited objects to show the visitors that there is something exciting at the end of the stairs, and that the visitors are allowed to go there. The exhibition could vary according to season and/or themes and make the whole staircase one big wall of inspiration. Another element could also be a place with code of conduct with pictures of the staff

and superusers and which machines they are experts. In that way, new users will know who can help them. This idea would be cheap for the staff at Makerspaces to implement, but it is important to keep updating it with new objects and new pictures when the users become superusers.

7.3.5 Event

This idea is to create smaller events with a specific goal that could be one specific product, for example a vase, or it could be season based where it could be events where the users for example could make place card and table decorations for weddings, confirmations, and other celebrations. Makerspace9220 now have Christmas events twice before Christmas, but we would like to see more of that type of events, because their Christmas event is popular and because we see a lot of unexplored opportunities regarding other seasonal events that can relate to women and the DIY aspect. With these events we want to focus on the product and not on the machines, and with products that appeal to women users and hopefully in that way, women would get their eyes open for what else they can make in Makerspace9220 and start to use them.

7.3.6 Further works

To further develop these five ideas, we would propose to have a meeting with the manager at Trekanten and the manager at Makerspace9220. At that meeting we would be able to present our findings from our study and the five ideas that led us too. The two managers would also be able to give us input from their point of view on what they consider being possible and suitable for them. This would lead to a nice discussion that could improve and complete our ideas. Before the meeting we could make small prototypes to visually show them our ideas, here we especially think of the two ideas with the step-by-step guidebook and the inspirational booklet where there is a specific atmosphere we want emphasize. Some of our ideas also have different small variations where the mangers would be able to tell which of the variation they see fit.

8. Conclusion

8. Conclusion

As we wrap up this thesis, it is evident that our metaphorical flight, i.e. the journey we undertook to foster empowerment and self-efficacy among women in makerspaces, has been as complex and multifaceted as expected. Inspired by the avian metaphor of a hatchling learning to fly, we initiated our study with a focus on the gender gap in makerspaces, especially within MakerSpace 9220. We sought to address a compelling question encapsulated in our problem statement: how could we design interventions that foster inclusivity in MakerSpace 9220, encouraging women to feel empowered and confident with the machines, and thereby promoting a diverse community of co-learners? To answer this, we delved into the rich world of Experience Design, applied qualitative methodologies, and engaged in a dynamic process of exploration, analysis, and reflection in lieu of our philosophies of science and action research.

Our exploration uncovered a few crucial factors influencing women's experiences and participation in makerspaces. We learned about the critical role of facilitators, the vital factor communities play, the importance of visibility of women in these spaces, and the significance of physical visibility of the space itself for visitors to Trekanten. Additionally, we identified an overarching need for gender inclusivity. Armed with these insights, we developed five proposals that provide tangible solutions to the identified challenges: the creation of step-by-step guidelines, an inspiration booklet, the display of pictures of women working within MakerSpace 9220, a nudging or change of the set frames surrounding the entrance to MakerSpace 9220, and events centred on comfort, security and creativity. These ideas not only offer potential strategies to enhance women's experiences in makerspaces but also serve as practical examples of how principles of Experience Design can be applied to real-world challenges.

When looking towards the future, there is much work to be done to create more inclusive makerspaces. We believe the proposals developed in this thesis could serve as a useful

starting point for MakerSpace 9220 and similar spaces. They offer strategies to enhance women's self-efficacy, increase their participation, and create a larger, more diverse community of learners. While we focused on MakerSpace 9220 in this study, we believe our findings and proposals could be relevant to a broader range of makerspaces and DIY communities. Moreover, as societal dynamics evolve, it will be essential to continue researching and exploring this area, with the ultimate goal of achieving inclusivity and equity in STEM fields.

In closing, we return to the poignant metaphor that initiated our journey: "You are taken by hand and then pushed out of the nest in an 'empowering' way, and you feel that you have the skills to master it all." Our hope is that the proposals and insights developed through this study will enable more women to confidently spread their wings, master the tools and machines of makerspaces, and make their valuable contributions in these creative and innovative spaces.

With its successes and learnings, our study emphasises the need for inclusive, equitable, and empowering spaces in the maker movement. We hope it contributes to the ongoing discourse and encourages further research to pave the way for more hatchlings to take flight and thrive in their unique and valuable ways.

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