



MALMÖ UNIVERSITY
FACULTY OF CULTURE
AND SOCIETY

Ember Light, the meeting glow

An interactive art installation to foster human
connection at Music Festivals

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Abstract

This project investigates how an art installation can be designed to promote social interaction and presence at music festivals. The project critiques the fact that modern music festivals present over-stimulating visual media that isolate people from their surroundings. This, along with the increasing use of smartphones to share the experience on social media, detaches people from the present moment, making them less likely to establish real connections with others. Through a Research through Design approach and the Design Thinking Bootleg Methodology, an art installation was developed using the Mellow Joint, a component for assembling pallets developed by the startup Mellow Designs based in Copenhagen. The art installation is inspired by the ancient experience of gathering around the fire. The design solution features a central warm light that increases in intensity as more people sit on the pallets. The user test conducted concludes that the art installation successfully evokes feelings of connection, presence and comfort, creating an environment that invites social gathering.

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1. INTRODUCTION: AIM AND RESEARCH QUESTION

Music festivals have always been events for artistic expression and since the 60's for the push of progressive ideas and social change. It is argued that music festivals have the potential to gather large amounts of people who share similar values and ideas, creating a sense of community (Jager, 2022). They are a place where different art forms blend such as sculpture, dance, and digital art and therefore, they are a source for inspiration, where new ideas and art forms can merge. An example of this is presented in art at the music festival Blueprints and the Chronotope (Kill, 2018), where Kill mentions the festival Woodstock in 1969 presented as a Music and Art Fair. They offer the space for art installations that seek not only to impress the public through design and aesthetics but also to promote ideas that break with the status quo, invite reflection, and fight against capitalism, climate change, and social exclusion. They are an invitation for people to connect with their artistic side, discover themselves and feel integrated into society. Besides, music festivals usually promote other activities apart from assisting the concerts, that also seek social integration and personal discovery, like Yoga, dancing classics, pottery workshops, painting etc. (Ballantyne et al., 2013).

Music festivals and the art exhibitions exhibit there, seek to promote social connection and bonding between the attendees. However, Wilks came to the conclusion that this type of event successfully increases the cohesion between people from the same group of friends, while it is less common to create cohesion across groups, which is usually the aim (Wilks, 2011).

During the last decade, interactive technologies have influenced different art forms, such as painting, music, theatre and dance. The implementation of these technologies in art opens up new ways of expressing human creativity and the art installations at music festivals have been influenced by them (Mullis, 2013).

An interactive art installation could be defined as art that actively involves the viewer through physical or sensory interaction by using interactive media. This interaction allows the user to influence the behaviour, appearance, or elements of the installation, such as sound, visuals, or movement (Scholz Bachelor et al., 2023). The technologies and elements that these art installations usually implement are kinetic cameras, digital screens, proximity & touch sensors, lights, sound, creative coding etc. To provide some examples, the Interactions could be based on the user's body position and movement in space or on specific gestures. They usually explore the integration of multiple users and how they interact with each other through the art form and the effect they have on it. Lately, they usually aim to create interactions that are intuitive, easy to understand and meaningful, fostering connection between the participants and acting as gathering points. (Scholz Bachelor et al., 2023) (Vogel & Balakrishnan, 2004).

1.1 Stakeholders

1.1.1 *Mellow Designs*

Mellow Designs is an innovative studio focused on circular product design. Rooted in Scandinavian traditions and design principles, they create furniture for festivals and outdoor events by joining pallets together using their Mellow Joint system (Designs).

This project aims to use their system to create pallet structures for an art installation.

1.1.2 *Karrusel festival*

The upcoming festival the company is collaborating with is 'Karrousel' in Denmark, a boutique electronic music festival held annually in Copenhagen, Denmark. Known for its immersive atmosphere and eclectic lineup, it offers a unique experience for electronic music enthusiasts. This project aims to design for this event and location (Refshaleøen, 2025).



Figure 1. Karrusel festival Copenhagen (Refshaleøen, 2025).

1.1.3 *Festival goers*

Festival goers are defined as the people who go to music festivals. It doesn't necessarily refer to the people who go frequently (CollinsDictionary, 2025).

1.2 Problem formulation

With the rise of visual media and technology, the music performances in music festivals have moved to be purely about music and dancing, to become a spectacle of lights, visuals generated through creative coding, fireworks, etc. Taking users on an immersive journey and enhancing the overall experience. However, these performances might be so stimulating for the user that they detach themselves from their surroundings, losing interest in interacting with the people around them. Additionally, many people feel the need to record the entire experience on their phones to share it on social media, further distancing them from the present moment (Evenbrite).



Figure 2. Anyma show in After Life Chile (Anyma, 2024).

Taking that into account, the project aims to create an art installation that is not overstimulating for the user, but rather the interaction is ambiguous, invites for social gathering and opens up conversation.

Research question:

- How can an interactive art installation be designed using Mellow Designs' pallet system to promote social interaction and presence at Music Festivals, in contrast to the overstimulating visual performances that isolate attendees?

2. Theoretical Background

2.1 Research Through Design

Research through Design (RtD) is a practice-based research approach where designing, including activities like prototyping, concept development and iterations, is conceived as a central method for generating knowledge. In contrast to traditional research, which frequently looks for theories that can be applied broadly, RtD focuses on developing artefacts that represent solutions to challenging, real-world problems in order to generate contextual insights (Zimmerman et al., 2007).

2.2 Design Thinking Bootleg

The Design Thinking Bootleg Methodology, developed by Stanford University, is a well-structured and easy-to-follow methodology with a focus on the user that provides a set of methods to trigger innovative solutions.

It is about embracing simple mindset shifts and tackling problems from a new direction. It provides a guide for designers to keep things organised and not lose focus along the process by dividing it into phases. It focuses more on the goal rather than the problem itself, and it is especially useful when the problem is too open or difficult to understand (Doorley et al., 2018).

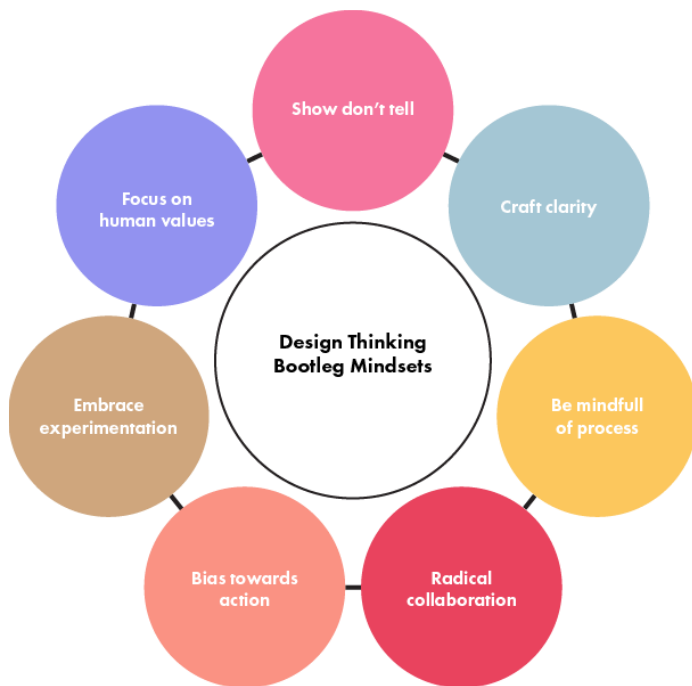


Figure 3. Design Thinking Bootleg Mindset (Doorley et al., 2018).

The Design Thinking Bootleg is structured in five “modes” identified as the components of Design Thinking. Those components are empathize, define, ideate, prototype and test.

2.2.1 Empathize

Empathy with the user is considered the foundation of a human-centred design process. To empathize is necessary to: Observe the user in their context, Engage with the users and Immerse oneself in the user’s experience (Doorley et al., 2018).

2.2.2 Define

Findings are synthesised into insights. The main goal is to summarise the information obtained in the first stage to be able to have a proper understanding of the context and the user before moving forward to ideation (Doorley et al., 2018).

2.2.3 Ideate

The goal of ideation is to generate multiple solutions without getting too focused on details. Variety is highly valuable, and combining and sharing ideas within the teams helps a lot. “It is a mode of flaring rather than focus”. (Doorley et al., 2018).

2.2.4 Prototype

Prototype consists of getting ideas and exploration out of the head and into the physical world. It helps a lot to see which ideas work best when designers can experience and interact with them in a more tangible way. What the design team learn from those interactions can help drive deeper empathy, as well as shape successful solutions. Prototypes help in synthesising the ideation stage and to evaluate ideas more objectively (Doorley et al., 2018).

2.2.5 Test

The testing mode consists of presenting prototypes to the user in a context that is close to the real situation. Testing can reveal gaps that haven't previously been considered and bring new ideas or modifications. It is therefore not the end of the process, since after the test, there is often a need to come back to the drawing board and reiterate between the different stages. For this reason, the Design Thinking Bootleg shouldn't be interpreted as a step-by-step guide but rather as an iterative process (Doorley et al., 2018).

2.3 Emotional Design

Emotional design is a design perspective that focuses on how users' emotions play a significant role in the way we relate to products. According to Don Norman in his book *Emotional Design: Why We Love (or Hate) Everyday Things*, the emotional side of a design is considered more important when determining a product's success than the technical characteristics of a product. This connects with the current literature on cognitive science, showing that emotions are inseparable from cognition. Therefore, designers must meet users' needs but also be aware of their emotional responses. The emotional aspect of a product affects its user experience in three main ways:

- It can create a deep connection between the user and the product.
- It provides more satisfaction. Since the product provides positive emotions, minor issues might be forgiven.
- A product that provides positive emotions is easier to remember

D. Norman, in his book *Emotional Design*, states that affection may also arise in three different levels, but with a focus on cognitive involvement concerning products.

i) The visceral level refers to the immediate response, the first impression, such as a smile on the face or a sense of pleasure when touching a smooth surface.

ii) The behavioural level, which refers subconsciously to the user's evaluation in their everyday use of the product, if they feel satisfied when achieving a task using it or the product helps them to achieve their goals.

iii) The reflective level, after the first interactions with the design, users start to judge the product for its performance, benefits, meaning and value for the money.

These three levels highlight that emotional engagement with the product not only happens through aesthetics but also through usability and reflection (Norman, 2004).

2.4 Experience Design

Experience Design is a perspective presented by Marc Hassenzahl that focuses on the experiences users have when interacting with products. In the same way that Don Norman shifts the focus from functionality to emotions, Hassenzahl prioritises the generation of meaningful experiences (Hassenzahl, 2010).

The concept of “experience” is borrowed from the discipline of philosophy. J. Dewey explains that experiences are the process of the “doings” and the “undergoings”. The user is transformed by the interactions with the product until both the object and user are mutually adapted through a feeling of harmony. Therefore, the aim is that the user ends up engaged in the experience not only through bodily sensations and direct perceptions but waking up the analytical mind and inferential thinking (Dewey, 1934).

Marc Hassenzahl argues that designers should have an idea of the experience they want to create first, how the user should feel and what they should remember, before generating ideas. The goal is to create a meaningful story that resonates deeply (Hassenzahl, 2010).

2.5 Design for Behavioural Change

Design for Behavioural Change (Dfbc) focuses on shaping products and services that influence how people act. These projects typically involve collaboration across various disciplines and aim to guide individuals toward adopting new behaviours or sustaining positive ones. Through thoughtful design interventions, people are supported in becoming more aware of their actions and encouraged to align with desired behavioural goals (van Boeijen et al., 2020).

3. METHOD

3.1 Empathize

3.1.1 Literature review

A literature review is an essential part of Research through Design for conducting research and finding useful information. It presents the current state of knowledge in a scientific area. The Literature review informs design decisions by grounding them in theory. It positions the work in relation to similar projects, it helps find gaps for creating new knowledge and supports reflection in the later stages of the project (Säfsten et al., 2020).

3.1.2 Brand DNA

This method is extracted from the *Delft Design Guide*, (van Boeijen et al., 2020), and it helps designers define the main “ingredients” of a brand. This is an important tool to position the brand on the market, understand its values and make sure designers are faithful to them.

3.2 Define

3.2.1 Checklist for concept generation

This tool is taken from the Design Thinking Bootleg methodology. Once sufficient information is collected from the research stage, data is synthesised. A list of product requirements is essential for setting up the key aspects that a product should have to be successful. This method can also be used later on to decide between different ideas. According to Stanford Design School, the checklist for concept generation ensures that concepts are “valid, insightful, actionable, unique, narrow, meaningful, and exciting” (Doorley et al., 2018).

3.2.2 Persona

Persona is a common method in Design that creates a fictional character that represents the main characteristics of the user. It presents their concerns, needs, wishes, likes and dislikes. It is a tool that should be taken into account throughout the whole process, since designers often fall into applying their own personal needs (van Boeijen et al., 2020).

3.2.3 Definition of emotional goals

The thesis presents the method of defining emotional goals, drawing from the perspectives of Emotional Design, Experience Design and Design for Behavioural Change. The method focuses on the behavioural and reflective levels of affection and on creating meaningful and emotional experiences. As Marc Hassenzahl states in Experience Design, it is important to have a clear vision of the intended experience. Additionally, the outcome of that experience will hopefully result in a behavioural change. Therefore, the Definition of Emotional Goals is intended to guide the design process by defining the desired emotions that the art installation should evoke in the user (Norman, 2004) (van Boeijen et al., 2020) (Hassenzahl, 2010).

3.2.4 Definition of Design Strategies

In a similar way that User Needs are commonly transformed into product requirements or specifications in Product Development (Ulrich & Eppinger, 2004), the emotional goals should be transformed into what this thesis calls Design Strategies. This method acts as a bridge between abstract goals and specific design decisions. The Definition of Design Strategies guides the ideation stage of the design process and ensures that emotional aspects are considered when creating a meaningful experience (Norman, 2004) (van Boeijen et al., 2020) (Hassenzahl, 2010).

3.3 Ideate

3.3.1 Analogies & metaphors

This method assists designers during ideation by taking inspiration from completely different fields that are somehow related to the concept at hand. Analogies focus on extracting the qualities from a different context and applying them to the project, while Metaphors focus on

communicating a particular message and “represent the meaning that a product evokes” (van Boeijen et al., 2020).

3.3.2 Sketching

A sketch is a rapid representation of an idea. It might record something that the artist sees, it might develop an idea for later use, or it might be used as a quick way of graphically demonstrating a principle. Sketches are not supposed to be finished versions of the idea, and they can be done using any medium, pen and paper, cardboard, through digital tools, clay, etc. (Verstijnen et al., 1998).

3.3.3 CAD

“3D CAD (3-dimensional computer-aided design) is a technology that engineers, product developers and designers use to create functional, virtual prototypes of three-dimensional objects”. With 3D CAD is possible to make testing simulations, draw, share, review and modify designs easily (SIEMENS).

3.3.4 Rendering.

Rendering consists of creating a realistic representation of a concept, usually used in sales and marketing. It uses 3D models created in CAD software and exported into the rendering software. Inside the rendering software, materials, textures, lights and environments can be applied and created. Rendering software mimics the characteristics of a photography studio, allowing for the modification of camera settings and the behaviour of light (Segasby, 2022).

3.4 Prototype

3.4.1 Prototyping

Traditionally, prototyping is defined as a way of testing the functionality of a product. But prototyping is used for many other reasons:

- Empathy gaining. Prototyping is a tool to deepen your understanding of the design space and the user.
- Exploration. Develop many different solutions.
- Testing. The material used in the user test.
- Inspiration. Inspire others by showing the vision.
- Learning. A prototype can transmit more than a simple picture or sketch.
- Solve disagreements. Prototyping is a powerful tool for solving miscommunication and getting to an understanding.
- Start a conversation. A prototype can be a great way to have a different conversation with the users and between members of the team.
- Fail quickly and cheaply. Creating quick and dirty prototypes allows us to test ideas without investing a lot of time and money upfront (Doorley et al., 2018).

3.4.2 Laser Cut.

Laser cutting uses vector drawing to cut materials such as wood, cardboard, plastics or metals. It is a slitting process based on a laser beam that follows the path of the vector drawing. When the beam hits the material, its high temperature melts it by concentrating all its power into one point. The advantage that this method presents is that the tool never gets into contact with the material, avoiding wear and tear in this way (Trumpf).

3.4.3 Coding - Arduino.

According to the official website, “Arduino is an open-source electronics platform based on easy-to-use hardware and software.” Arduino develops microcontrollers and sensors that can be used by programming code in “the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.” Arduino is a common tool in DIY projects and has a huge community online for support and inspiration. It is “an easy tool for fast prototyping, aimed at students without a background in electronics and programming” (Arduino, 2018).

3.5 Test.

3.5.1 Wizard of Oz

Wizard of Oz is a method applied when testing an early prototype that involves a human operator who secretly controls the behaviour of the prototype. It is done as an ingenious way to test whether a prototype is perceived the way it should or not, without spending a lot of resources on engineering, expensive components or materials. The mindset behind this method is “Try quickly and see if it works” (Buxton, 2011) (van Boeijen et al., 2020).

3.5.2 User Test

As the Literature Review collects data from scientific papers, the user test collects data from the user. User tests can be done to collect qualitative data in the form of interviews, workshops or observations or to collect quantitative data in the form of questionnaires or surveys, for instance. Methods used can be presented in a way that collects both quantitative and qualitative data. For this project, only qualitative data will be extracted through observations and group interviews. This could also be known as a workshop. According to K.Säfsten “A workshop is a work team for informal discussion or a meeting concerning a scientific or artistic subject where participants share their experiences, a so-called colloquium (i.e., scientific conversations and discussions) (Säfsten et al., 2020).

4. APPROACH AND IMPLEMENTATION

4.1 Empathize

4.1.1 Literature review

4.1.1.1 Interactive art installations

Interactive installations are commonly found in museums, in art galleries, at street festivals, presented in public spaces, close to nature etc. These installations often invite exploration, reflection, and social interaction, commonly aiming to provide a certain message. The creation of art installations, as any other art form, has always been deeply rooted in the human drive for artistic expression, being found across the globe in multiple cultures throughout the whole human history.

With the rise of digital technology, art installations have undergone significant development. Now it is possible to create more immersive experiences and to better communicate the meaning of the installation. Technologies like creative coding, augmented reality, virtual reality, motion tracking, haptics, etc. open up a huge new scope for creative possibilities (Scholz Bachelor et al., 2023). Technology also allows the possibility of making the individuals to transform the art installation, making them active participants in shaping the experience. Already in the 90s, researchers like Ishii, H and Ulmer, B, in *Towards Seamless Interfaces between People. Bits and Atoms* (Ishii & Ullmer, 1997) noted a transition from passive observation of digital media to active participation, creating more tangible, collaborative and meaningful environments (Hespanhol & Tomitsch, 2012).

4.1.1.2 Performative vs Ubiquitous interactions

How the technology is used and placed in the art installation plays a significant role in the overall experience. Therefore, the placement and the qualities of the interaction should align with the intended purpose of the installation. In those lines, Luke Hespanhol and Martin Tomitsch, in *Designing for Collective Participation with Media Installations in Public Spaces*, present two types of interaction models. Ubiquitous Interactions and Performative Interactions (Hespanhol & Tomitsch, 2012).

- Performative interactions: are those centred on performance that take place in a public space. Luke Hespanhol draws the similarity to a “stage” where individuals actively shape the interactive experience and are observed by other individuals. This type of interaction aims for social spectacle and is ego-driven. It aims to bring people together by watching the performance. The authors present some of the characteristics of this type of interaction:
 - The installations focusing on performative interaction provide immediate feedback to users, so the learning curve is fast, and they can directly engage with the artwork as soon as they interact with it.
 - Only one focal point is commonly used, catching the attention of the individuals towards one particular direction. “When people walk into a space where they can spot a display, it is therefore their natural expectation that some sort of narrative or performance will take place” Brignull, H., Rogers, Y. *Enticing People to Interact with Large Public Displays in Public Spaces* (Brignull, 2003)
 - For this type of interaction, the art installation can usually be displayed anywhere since they do not use the elements of the environment that much.

Common concerns with these types of interactions are that people can experience social embarrassment and therefore won't be willing to interact with the installation, only remaining passively observing the one performing. This type of interaction commonly succeeds in making people gather, however, it separates the users into two groups, the performer/s and the public.

- Ubiquitous Interactions: focus on blending the technology into the environment, inviting participants to explore their surroundings as they explore the technology. The interaction here is not as obvious as in the performative interaction, and the goal is more towards achieving a collective participation. The characteristics of this type of interaction are:
 - There are multiple focal points, looking for the interplay of the individuals and the surrounding environment. Making the participation less ego-centric and more collaborative.
 - The interactive feedback is not immediate, is usually ambiguous. It might take some time for the users to understand it, and it provides a sense of discovery and seeking collaboration.
 - These types of interactions, since they feature multiple focal points distributed throughout the space, are usually closely related to the place where the installation is exhibited.

Concerns regarding these types of interactions are that, despite having multiple focal points or high levels of participation, the users may not always be aware of how the installation is responding to their actions. Since the response doesn't usually occur in front of people's eyes, the feedback given may not be perceived as caused by anyone specifically.

Important to note is that the two models of interactions are not mutually exclusive; depending on the context, the environment and the message that wants to be transmitted, it is possible to create an installation that is a mix of both.

Luke Hespanhol and Martin Tomitsch in *Designing for Collective Participation with Media Installations in Public Spaces*, thoroughly analyse examples of each type. They do a thorough analysis on the art installation *Liquid Light* as an example of Performative interaction and on *Chromapollination* as an example of Ubiquitous interaction (Hespanhol & Tomitsch, 2012).

- Liquid Light. "Liquid Light aimed to address the feeling of physical disconnectedness paradoxically on the rise as modern society gets increasingly connected through technology". The art installation consists of a big digital screen (one focal point) that displays the silhouette of the people in front of it as "glowing auras". The heads of the silhouettes are connected by shining halos as soon as more people get into the performance area. People stayed connected for as long as they appeared on the screen.



Figure 4. Liquid Light (Hespanhol & Tomitsch, 2012).

- **Chrommapollination.** As part of the arts festival Vivid Sydney, encourages the development of artworks that involve the use of light and interactive technology. Chrommapollination is located in an area under the Circular Quay Station, one of the busiest transport hubs, where thousands of people pass by daily while commuting to work. It aims to bring attention to the forgotten presence of that particular urban space. The installation consists of three sculptures of dandelion flowers that glow in different colours. Hanging on the ceiling, there are 2000 LED lights that can be controlled individually. When people step into the art installation, their movement produces a “digital wind” that causes the flowers to release pollen in the form of light that travels across the hanging lights on the ceiling until it reaches another flower, changing the flowers in colour as they get “pollinated”.



Figure 5. Chrommapollination (Hespanhol & Tomitsch, 2012).

Lately, as presented by Luke Hespanhol and Martin Tomitsch, the following table provides a set of considerations for developing each type of interaction (Hespanhol & Tomitsch, 2012).

Table 1. Performative vs. Ubiquitous interactions. Considerations (Hespanhol & Tomitsch, 2012)

Performative interaction	Ubiquitous interaction
Reduce the number of focal points.	Reduce or eliminate obvious focal points.
One-to-one mapping between audience input and feedback.	Make the feedback diffused or ambiguous.
Use of standalone media (e.g visible media displays).	Embed the medium into the work.
Minimise the use of highly tangible environments.	Make strong use of tangible experience.
Reduce the need to make the work situated.	Aim for augmenting the surrounding environment.

4.1.1.3 Interactive Art Installations at Music Festivals

Interactive art installations are a powerful way of shifting people's perspective through art and technology. They are often used to promote social change, visualise global issues, highlight human impact on the environment, or amplify the voices of marginalised groups. This aligns with the spirit of Music festivals, which frequently provide spaces for art exhibitions, debates, and social activities. Providing the perfect environment for art installations that aim to have a meaningful impact.

Art installations in music festivals are experienced as part of the festival, and therefore, the context of the festival must be considered, seeing the art installation as part of the stories individuals are going to bring back home about the festival (Epure et al., 2017). This adds on taking into consideration the environment that surrounds the installation, as it was introduced when presenting the ubiquitous type of interactions. In HCI and Interaction Design, this is considered a genre on its own, known as *Place-specific computing* (PSC). According to Jorn Messeter "PSC centres on the design of digital systems and services whose functionality and information intrinsically stem from the social and cultural practices of a specific place, taking into account its structuring conditions, both social and material." (Jörn, 2009).

Music festivals in particular present what Turner, V.W defines as *Liminoid environments* "temporal fringe spaces where usual, everyday social conventions may be temporarily suspended or reversed" (Turner, 1976). Traditional hierarchy and social classes blur, and people focus instead on their similarities, like their shared taste for music. People act more spontaneously and seek to connect with others regardless of their identity outside of the festival. Music festivals open up the opportunity for strangers to meet who otherwise would have never crossed paths. Epure et al. present the concept of Liminoid structures, referring to those art installations that take advantage of these qualities of music festivals.

- Liminoid structures should function as a medium for bringing people together.
- They should promote cooperation among people who don't know each other.
- The design should consider the relaxed social norms and low interaction barriers typical of music festivals (Epure et al., 2017).

Mix&Match is a good example of a liminoid structure at a music festival.

- Mix&Match. With the goal of enhancing social sustainability, this art installation consisted of an interactive floor divided into different zones with sound loops that

were played depending on the position of the user. The sound loops were constantly playing drums, guitar, bass and vocals. They are automatically synced and they are muted when not triggered by a user. This art installation fosters collaboration by inviting individuals to create music together. The loops feature sounds from different genres, trying to include people from different cultures and open up conversation between strangers in a playful way.

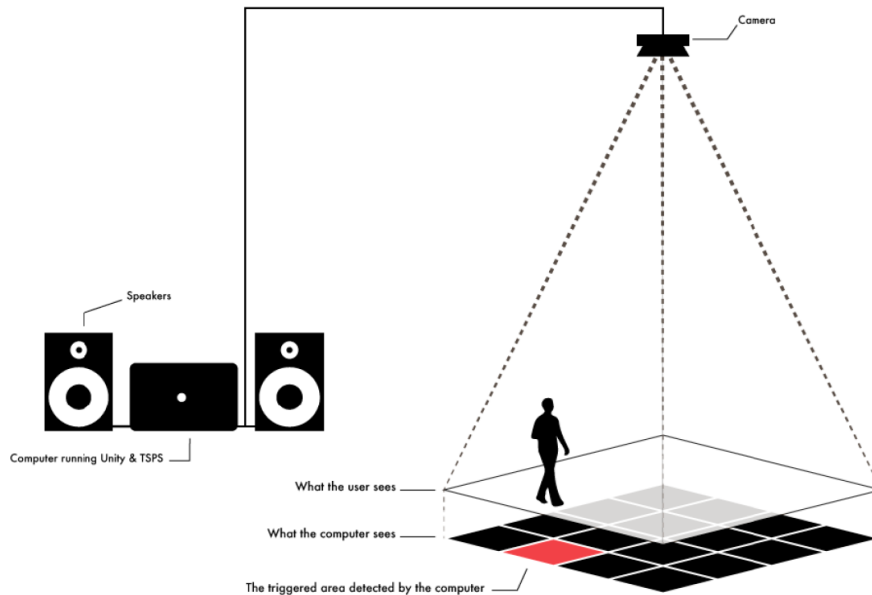


Figure 6. Representation of the art installation Mix&Match (Epure et al., 2017).

- The singing plant. This art installation was presented in Roskilde festival in the year 2002 in Denmark. It consisted of a living plant that produce complex harmonic sounds when touched. The touch interaction is sensed by a Theremin that transforms the touch signal into a sine wave that is then modulated using the software Ableton Live to get a richer sound. Additionally, the sounds produced were linked to an Arduino controller that changed the intensity of the light in the space, giving the effect that the plant was illuminated by touch. The aim of the installations was to invite individuals to reflect on the relationship between humans and plants (Hobye, 2014).



Figure 7. The singing plant. (Hobye, 2014).

- SwingScape. Also presented at the Roskilde festival in the year 2010, this art installation consisted of 8 swings provided with accelerometer sensors. The accelerometers were linked to different sounds so the users could create music while sitting on their swings and swinging along with others. Each swing influenced different elements of the overall soundscape, making the communication between individuals key for creating the best possible experience. The swings also provided visual feedback so user could be aware of how their actions were affecting the sound (Epure et al., 2017).



Figure 8. SwingScape (Gronbæk et al., 2012).

- Electrolumen, Roskilde festival 2010 & Julefryd Teatret Gruppe 2010. The art installation consisted of a telephone pole with four street lamps mounted around. The pole was two meters height so the lamps were situated right above users' heads. They play with the preconception that touching high-voltage electricity components can be dangerous. Although, in this case, instead of electrocuting participants, the

installation produces sounds when touched. Besides, the lights will light up when touched creating an intimate atmosphere around the pole (Ilutron, 2010).



Figure 9. Electrolumen at Roskilde festival 2010 (Ilutron, 2010).

All the examples presented above, along with Liquid Light and Chrommapollination, present the design principles presented by Scott S. Snibbe and Hayes S. Raffle when referring to Multi-user Interactive Exhibits for creating strong emotional responses and social engagement through visceral interaction. Those are:

- Visceral: the media is first experienced physically and emotionally through whole-body interactions, before is experienced symbolically or rationally.
- Responsive: the media responds clearly to users actions.
- Continuously variable: the media is continuously changing, stimulated by users' actions, like the natural environment.
- Socially scalable: the goal of the interaction is to share and collaborate with others. Moreover, the interaction should become richer as more people engage.
- Socially familiar: the individuals identify the meaning since the installation augments and reinforces existing collocated social behaviours.
- Socially balanced: the interaction balances users' awareness of themselves, of the media, as well as the presence and actions of others (S.Snibbe & Raffle, 2009).

To conclude, these types of art installations, when placed in the proper context, have the potential to enhance the characteristics and goals of a music festival by:

- Bringing together like-minded people, fostering a sense of community and shared values.
- Learning about people from different backgrounds, other cultures, and discovering music genres.
- Promoting reflection and personal discovery through experimenting with the art installation.
- Allowing users to creatively express themselves.
- Conveying meaningful messages that often call for social change (Epure et al., 2017).

4.1.2 Brand DNA

To make sure that the outcome of the thesis project aligns with company goals, it is important to identify the main principles that make Mellow Designs unique (van Boeijen et al., 2020).

4.1.2.1 Design for Sustainability

The company clearly applies this design perspective that aims to have a positive impact both for society and the natural environment. For the company Design for Sustainability is taken more as a requisite rather than a wish. They apply sustainability by repurposing pallets, which may otherwise be incinerated after being used. Moreover, pallets already have minimal impact on the environment, being considered relatively sustainable since they are made from recycled or reclaimed wood, and they can be repaired, recycled or reused through multiple cycles (van Boeijen et al., 2020).

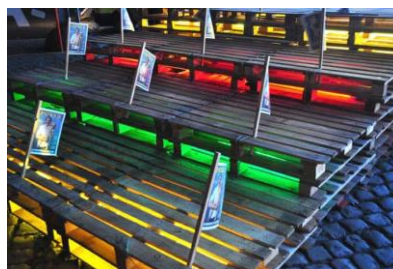
4.1.2.2 Pallet furniture

These are the advantages of creating furniture/structure by repurposing pallets:

- Sourcing pallets is simple and affordable, making them an economical option especially for large setups.
- Acting as Lego blocks, the wooden platforms are incredibly versatile, making it possible to fit any design, including complex configurations.
- Pallets are customizable; they can be painted and assembled together in different forms with relatively low equipment or technical requirements. They are also easy to disassemble and broken down into planks or blocks for a variety of purposes.
- There are thousands of resources online about DIY projects with pallets that encourage creativity and sustainability.
- They present a rustic and industrial look that is popular in modern and rustic interior design. They can usually be found in cafés, gardens and pop-up shows.
- Pallets are often presented in standard sizes, making it easy to create modular configurations.
- Since they are designed for carrying heavy loads, they are compact and strong, making them suitable for building solid structures (Arnegard, 2024c).



(a)



(b)

Figure 10. (a) Pallet sofa (Shawyer). (b) Pallets festival tribune (Neokentin, 2013).

4.1.2.3 Pop-up architecture

“Pop-up architecture refers to temporary structures that are designed to be assembled quickly and dismantled easily”. It offers a cost-effective and flexible solution for short-term events that allows architects and designers to experiment with bold ideas. Pop-architecture solutions usually feature the following characteristics:

- It is usually lightweight. Since its components are meant to be transportable, easily assembled and disassembled it usually uses light materials.
- Many components and parts are prefabricated to minimise the time spent assembling and disassembling.
- It usually uses unconventional material, sustainable solutions and new technologies. E.g. biomaterials, recycled materials, 3D printing etc.
- It usually has a strong focus on sustainability, often being less resource-intensive than a permanent structure.
- Modularity, allowing structures to be easily adapted based on the space conditions or the event needs. For that reason, it often uses standardised components (Arnegard, 2024a).

4.1.2.4 Mellow Designs Solutions

The company sells different versions of the component known as “Mellow Joint”. This joint allows the pallets to be fixed together in different positions, creating a variety of structures and opening up a lot of room for creativity without modifying the pallets in any way (Designs, 2025). Here are some examples of their solutions:



Figure 11. Mellow Joint (Designs, 2025).

Additionally, the start-up is initiating its journey as a sustainable design studio by offering other sustainable solutions, such as the Mellow Wall (Designs).

4.1.2.5 Collaborations with Music Festivals

The company is the perfect fit for creating temporary structures for Music festivals. Due to the temporary nature of these types of events and the support for circular practices that music festivals offer. Some of the company's collaborations include:

- Norden festival in Germany, where they provided a Dj booth, "The Strandhain stage".



Figure 12. Dj booth at Norden festival (Arnegard, 2024b).

- Neon festival in Norway, where they created a rest area with multiple furniture for people to relax.



Figure 13. Neon festival in Norway (Designs).

- Distortion festival in Denmark. One of the most innovative and energetic festivals featuring street parties, where they set up some tables, seats and a DJ booth.



Figure 14. Distorsion festival, Denmark (Designs).

4.1.2.6 Purpose, personality and positioning

To sum up the “ingredients” of Mellow Design, it is important to define their purpose, personality and positioning according to the Brand DNA analysis (van Boeijen et al., 2020).

- Purpose: To transform industrial waste, pallets in this case, into creative modular configurations for temporary events like music festivals. Mellow Designs promotes design for sustainability and the development of circular systems that are better for the planet.
- Personality: collaborative by nature. The company engage in collaboration with Music festivals and other stakeholders such as architects, engineers and other companies for providing lights, sound or electricity. They are highly flexible, adapting to the festival's needs and the space, providing a lot of room for customisation
- Positioning: they are positioned in the market as a sustainable design studio specialising in modular, affordable solutions using pallets for temporary events, aiming to bridge the gap between functionality and sustainability (Designs).

4.2 Define

4.2.1. Checklist for concept generation.

These lists gather all the characteristics of interactive art installations found in the Literature and presented by different authors. It has been decided to focus on ubiquitous interaction due to the problem identified regarding overstimulation and hyperfocus during Music festivals. The stage by itself was identified as a sort of art installation that reflects many of the characteristics of performative interaction. There is only one big focal point that makes people gather around, making individuals take the role of spectators. Therefore, it was decided that the goal was to create an art installation that helps users disconnect from that hyperfocus and instead fosters a collaborative experience, that invites conversation, reflection and seeks connection.



Figure 15. Checklist for concept generation.

4.2.2. Persona

	Mikkel is a 29-year old UX designer who enjoys going to music festival. Festival are for him a way to break with the routine, have fun and a chance to meet new people.
	Psychographics Personality: chill, friendly, introspective, curious. Hobbies: Music production, yoga, climbing. Interests: Techno & house music, reading, travelling. Challenges: Balanced social life with work. Need: find people with similar interests.
Name: Mikkel Sørensen Age: 29 years old Occupation: UX Designer Location: Copenhagen, Denmark	About music festivals Frequency: 1 or 2 years. Motivation: see his favourite artists, have with friends, connect with like-minded individuals, be part of a community. Online behaviour: share his experiences through social media. Corners: he finds it difficult to meet new people in a festival.

Figure 16. Persona. Image generated with Midjourney (Midjourney).

4.2.3 Definition of emotional goals



Figure 17. Definition of emotional goals.

4.2.4 Definition of design strategies

Emotional Goals	Design Strategies
Coziness & relaxation	Warm, amber/orange lighting temperature
Connection	Design that invites gathering (E.g Circular or Semi-circular)
Grounding	Minimal sensory overload, soft light and transitions
Presence	Focus, ambient noise

Figure 18. Definition of design strategies.

4.3 Ideate

4.3.1 Analogies & metaphors

Considering the Emotional Goals of the project, the thesis makes the analogy of gathering around the fire. Humans have been sitting around the fire since prehistory. It is a cultural activity that makes people gather, celebrate, and connect to others, and it is even associated with spiritualism and religion. Sitting around the fire provides a calm and cosy space that makes people feel relaxed and safe. Moreover, the almost hypnotic effect of the dancing flames usually has the effect of connecting to the present moment. The act is usually followed

by activities such as storytelling, playing games, singing songs or playing music. It is deeply connected to our nature, and it is common for people to associated with.

4.3.3 Sketching

The sketching technique was directed on a CAD software, Rhinoceros in this case. Since pallets are a standardised product, it was easy to find a 3D model of a Euro Pallet 1200x800mm on the internet. GrabCAD was the platform used for finding the 3D model (Ram, 2024). Rhinoceros offers the possibility to duplicate, rotate and mirror elements freely, which allows for the rapid creation of different configurations (Rhinoceros). At all moments, the angles and shapes that Mellow Design already works with were used, so it was certain that the concept could be developed in the future.

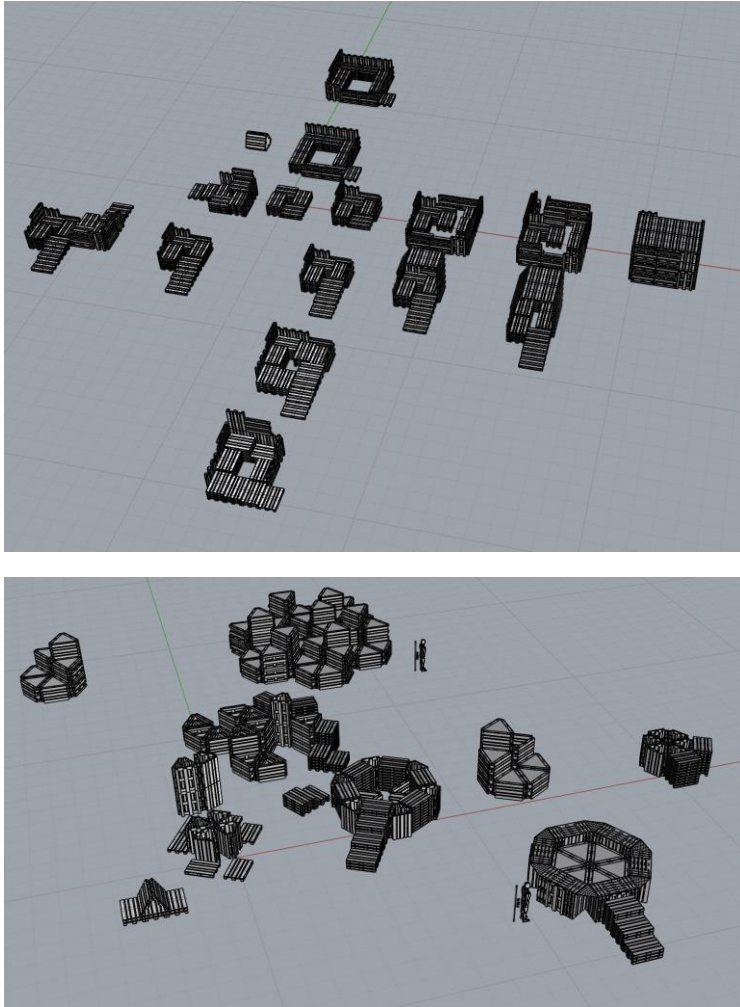


Figure 19. Sketching in Rhinoceros.

4.3.4 The concept

Four concepts were selected as the favourite ones. They all present a structure made out pallets that invites gathering around a central point. C3 and C4 offers are modular concepts, meaning that the structure in its simple form consists of only one unit. But it can be duplicated and arranged in different orientations so eventually more complex configurations can be form. In this way, it possible to scale up and down the whole art installation, adapting it to the characteristics of the space while also offering customisation options for the festival organisers.

All concept present one light in the middle in the form of a LED tube that will feature warm colours. The colour temperature range is between 1800K and 2200K. This range provides a warm amber hue similar to the flames of the fire. Besides, this temperature range has been proved to support body's natural circadian rhythms in the afternoons, creating a cozy atmosphere that helps people relax and unwind (Protection).

The interaction is designed so that the art installation presents a dim light intensity if there is no one sitting around. When someone sits in one of the pallets, the light gets brighter. This effect lasts for about ten minutes, after which it slowly dims back to its original intensity. However, if someone joins during this period, then, by being two sitting around, the light's intensity increases to a brighter level as well as its duration of it. This pattern goes on, meaning that the intensity and the duration of the light are proportional to the number of people sitting on the pallets. In conclusion, the more people present, the brighter it gets and more obvious is the effect of the art installation.

This concept draws from the analogy of people working together to keep the fire alive, as if they were putting wood into the fire to keep its duration and brightness.

The concept C4 was the one decided to continue working on for its modularity feature, its simplicity and the low number of pallets required. Although C3 was also considered for its modularity, it was decided to be discarded due to its different heights, which could compromise safety in a festival context, where people are usually having fun, dancing, jumping and less aware of the potential risks around.



Figure 20. Concept 1.



Figure 21. Concept 2.

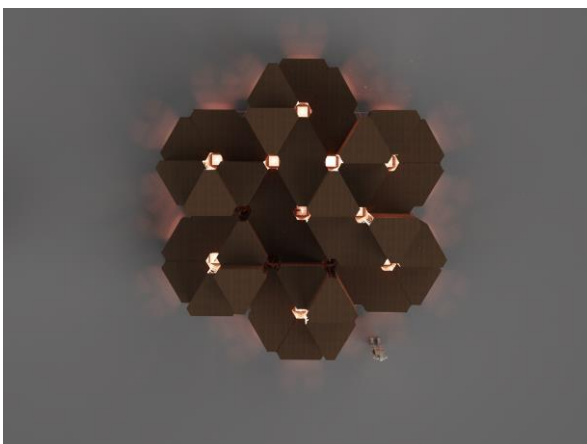
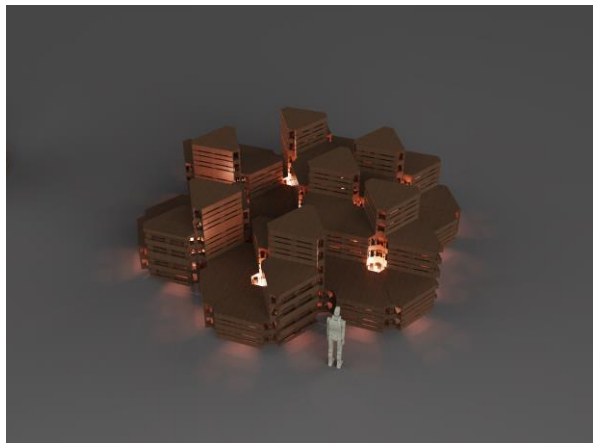


Figure 22. Concept 3.

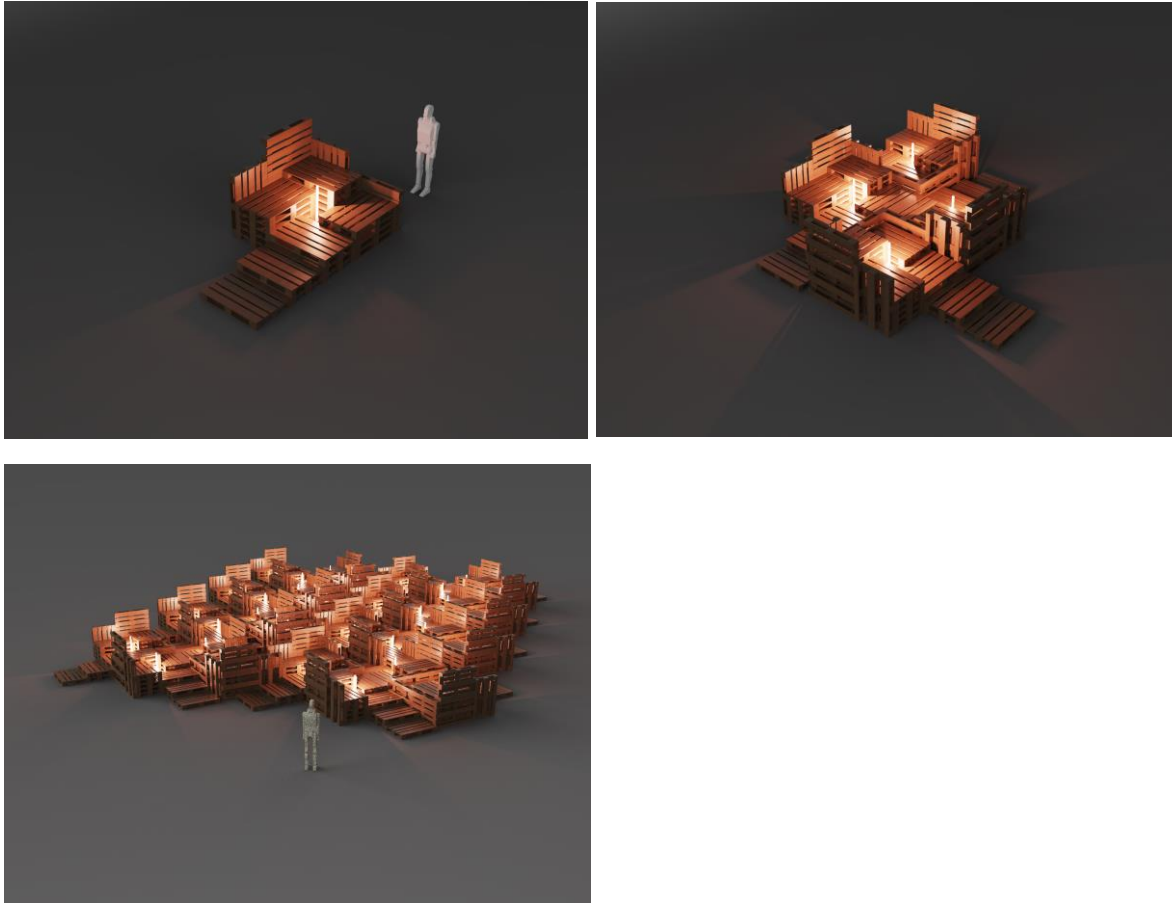


Figure 23. Concept 4.

4.4 Prototype

Two prototypes were built following the model of “what prototypes prototype”, presented by Houde & Hill. The model comes from the notion that different types of prototypes focus on different design goals when representing the “design artefact”, as they call the result of a design activity. The model is represented by a triangle, where in each corner there is a design dimension. The model guides designers in defining the objective behind building the prototype and the approach they should follow to meet that goal. The three dimensions presented in the model are:

- Role: the goal of the prototype is to present the user with the function of the artefact, “the way in which it is useful to them” (Houde & Hill).
- Look & feel: the goal of the prototype is for the user to experiment with how the artefact makes them feel and how it is perceived.
- Implementation: the goal of this type of prototype is to define how the artefact works. It defines the technical aspects and the components required for the artefact to perform its function (Houde & Hill).

The first prototype built focused on the “Look and Feel” dimension. It was built in real scale using 27 pallets with two objectives. 1. To test if the structure was possible to be assembled using the Mellow joints. 2. To test the concept with real users.

The second prototype was built on a small scale to explore how the concept may be made to work, exploring more technical aspects such as Programming, the placement of the sensors and the qualities of the light. This prototype focused on the “Implementation” of the artefact.

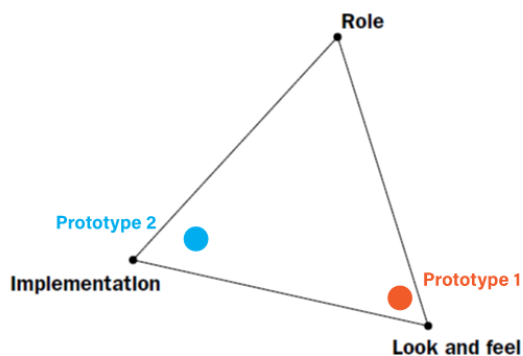


Figure 24. The prototyping model (Houde & Hill).

4.4.1 Look and feel prototype

To build the prototype the company Mellow Designs was contacted for permission to borrow a set of Mellow Joints. By observing the products that the company already have, it was possible to estimate how many Mellow Joints of each type were required.

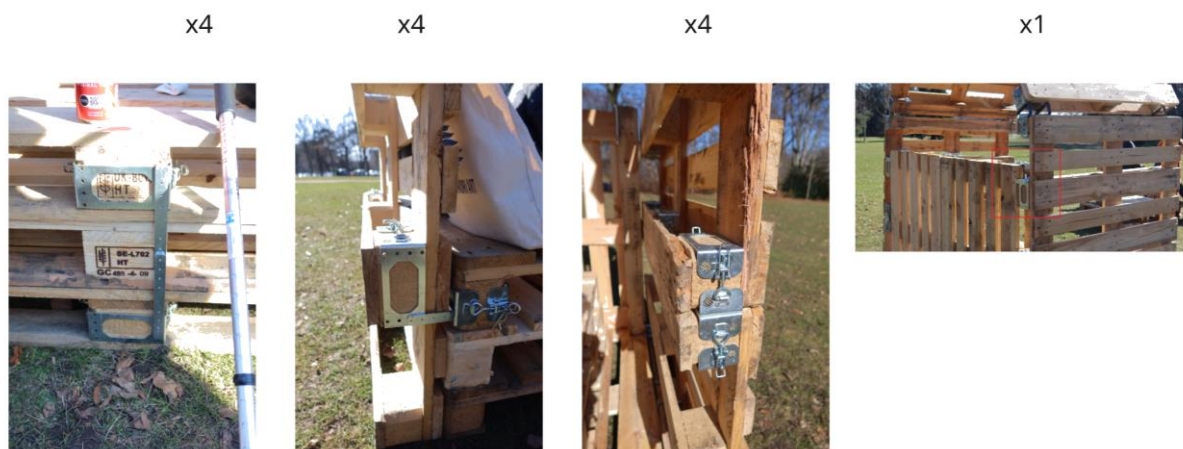


Figure 25. Mellow Joints required (Designs, 2025).

Pallets were borrowed from UNICEF Supply and Logistics Headquarters in Copenhagen. The author had access to the installations during the time of the project and counted on the help of UNICEF personnel to assemble the prototype.



Figure 26. Look and Feel prototype under construction.

A LED tube was placed in the middle of the structure, covered by red transparent plastic foil. The light had a dial in the base that allowed the regulation of the intensity.



Figure 27. LED Light tube.

4.4.2 Implementation prototype

This prototype used Arduino components and was coded in C# in Arduino Software. The scale of the prototype was determined by the dimensions of the NEO Pixel Stick Light with 80 5050 RGB lights by Adafruit (Adafruit).



Figure 28. NEO Pixel Stick Light with 80 5050 RGB lights (Adafruit).

The other components used to build the prototype were:

- Arduino NANO.

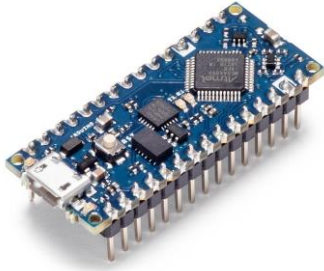


Figure 29. Arduino Nano (Arduino).

- Adafruit MPR121 12-Key Capacitive Touch Sensor.



Figure 30. Adafruit MPR121 12-Key Capacitive Touch Sensor (Adafruit).

- Jumper wires.



Figure 31. Jumper wires (E. Arduino).

- Mini breadboard.

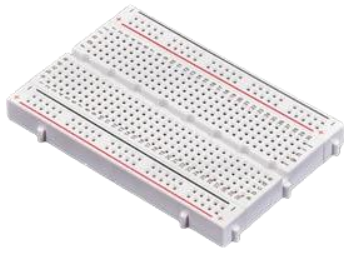


Figure 32. Half-sized breadboard (Adafruit).

- Copper wire.



Figure 33. Copper wire 2mm thick (VAKOOBA).

4.4.2.1 Coding

The code controls one NeoPixel Stick Light using 4 touch points of the Adafruit MPR121 12-Key Capacitive Touch Sensor. Depending how many touch points are touched the Light Stick will light up different pixel lights, going through 4 different levels.

- Level 0: nothing is touched -> Only the first pixel of the Stick Light will be lit up.
- Level 1: one touch point has been touched -> The first two pixels of the Stick Light are lit up.
- Level 2: two touch points have been touched -> The first 4 pixels light up.
- Level 3: three touch points have been touched -> The first 6 pixels light up.
- Level 4: all four touch points have been touched -> All the pixels light up.

```

/* ===== */
void loop() {
  if (millis() - lastUpdate > 50) { // Limit updates to every 50ms
    readTouch();
    showFire();
    lastUpdate = millis();
  }
}

/* ----- readTouch() ----- */
void readTouch() {
  touchBits = cap.touched(); // Read touch sensor state

  // Count how many touch points are active
  int touchCount = 0;
  if (touchBits & _BV(6)) touchCount++;
  if (touchBits & _BV(5)) touchCount++;
  if (touchBits & _BV(4)) touchCount++;
  if (touchBits & _BV(3)) touchCount++;

  // Assign levels based on number of touches
  switch (touchCount) {
    case 4: pixelsToLight = 8; break; // Level 4 - Four touch points
    case 3: pixelsToLight = 6; break; // Level 3 - Three touch points
    case 2: pixelsToLight = 4; break; // Level 2 - Two touch points
    case 1: pixelsToLight = 2; break; // Level 1 - Any one touch point
    default: pixelsToLight = 1; break; // Level 0 - No touches
  }
}

```

Figure 34. function readTouch() register in the variable touchCount how many touch points have touched and assign the number of pixels to light up to the variable pixelsToLight. The touch points are on PIN 6,5,4 and 3 respectively.

The qualities of the light are controlled by the function void showFire(), which simulates a fire-like effect. It provides a flicker that slightly modifies the brightness of the red value each time the loop runs. Additionally, it determines which pixels should light up and ensures a smooth fade-in and fade-out transition whenever the level changes.

```

/* ----- showFire() ----- */
void showFire() {
  static float intensity[NUMPIXELS] = {0}; // Stores brightness levels per pixel
  float flicker = random(-2, 2); // Adds subtle variations
  brightness = (sin(millis() * SPEED * PI) + 1.0f) * 0.25f; // Smooth fire effect

  uint8_t rBase = 180 + brightness * 60 + flicker; // Fire red range (180-220)
  uint8_t gBase = 50 + brightness * 40; // Yellow-orange (50-100)
  uint8_t bBase = 10 + brightness * 10; // Minimal blue tint (10-40)

  for (uint8_t p = 0; p < NUMPIXELS; p++) { //p refers to each individual pixel. It increases its value until it reaches NUMPIXELS
    if (p < pixelsToLight) {
      // Gradually increase intensity for newly activated pixels
      intensity[p] = min(intensity[p] + 0.02, 1.0);
    } else {
      // Gradually fade out inactive pixels
      intensity[p] = max(intensity[p] - 0.02, 0.0);
    }

    // Apply smooth brightness scaling
    uint8_t r = rBase * intensity[p];
    uint8_t g = gBase * intensity[p];
    uint8_t b = bBase * intensity[p];

    stick.setPixelColor(p, stick.Color(r, g, b));
  }
  stick.show();
}

```

Figure 35. showFire() simulates the dynamic fire effect of the light. The complete code can be found in the Appendix 1.

4.4.2.2 Laser Cut

All the components of the prototype not mentioned before were laser cut. The materials used were:

- 3mm MDM wood for the pallets' wooden planks.
- 6mm MDM wood for the pallets' legs.
- 2mm acrylic plastic transparent for the top planks of the top pallets. These ones needed to have some elasticity since they acted as buttons to activate the touch points.
- 3mm translucent acrylic plastic. To create the case for the light which hides the Stick Light and makes the light smoother.
- 3mm cardboard. To create the base of that holds the prototype.

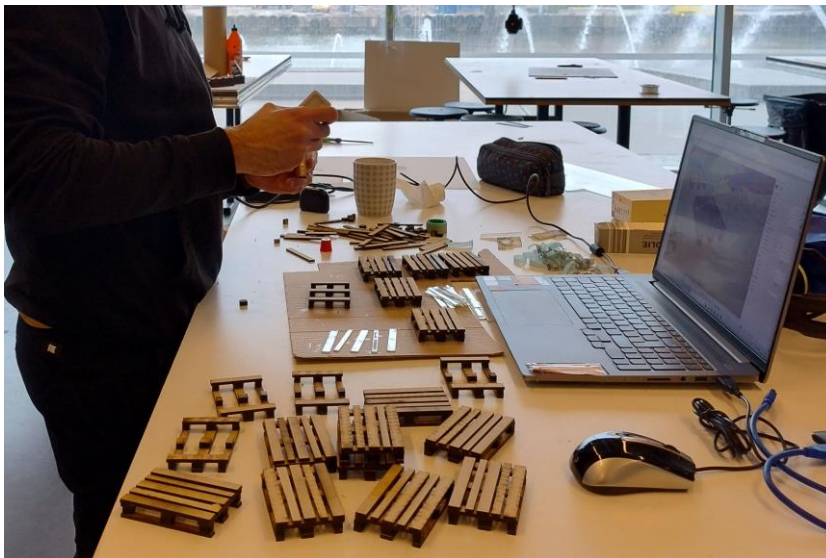


Figure 36. Building the Implementation prototype.

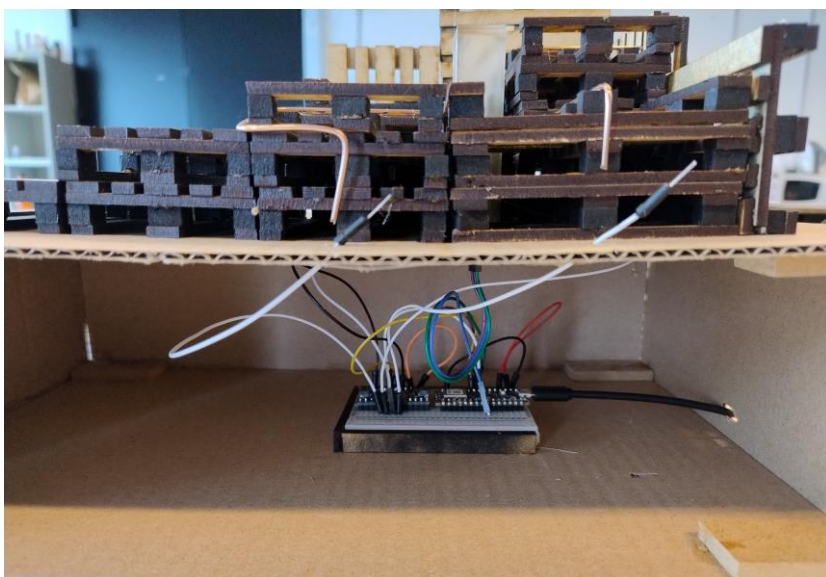


Figure 37. Arduino connections in the Implementation prototype.

The thick copper wire was placed on the top pallets and connected to the jumper wires. As soon as a conductive material touches the copper wire, the MPR121 12-Key Capacitive Touch sensor will receive the signal.

The conductive material used was Aluminium foil, and it was placed under the top plastic planks of the top pallets. When top plastic planks are pressed down, the aluminium foil touches the copper, and the signal is sent to the capacitive touch sensor.



Figure 38. Implementation prototype without the top flexible planks.

4.5 Test

As mentioned before, the user test was conducted using the Look and Feel prototype at the garden of UNICEF Supply Division in Copenhagen. Participants were invited to explore the installation and were asked a set of questions in group. The questions opened up conversation about the nature of music festivals nowadays, participants shared previous experiences and co-imagined how the installation might work in a festival context.

4.5.1 Wizard of Oz.

The Wizard of Oz method was used to evaluate how the light makes participants feel and how the interaction was perceived (Buxton, 2011) (van Boeijen et al., 2020). One of the user test phases consisted of participants sitting one by one on the pallets. The author was sitting next to the light, so he had access to the dial that regulates the intensity. As participants were sitting on the pallets, the author was increasing the intensity of the light, and as they were leaving, he was decreasing it.



Figure 39. Light source in the Look and Feel prototype.

4.5.2 User Test Plan

The user test was divided into 5 different parts.

- **Part 1. Introduction.** The speaker first presented himself, his background and the reason for the test. Participants were presented with the perceived problem of overstimulation and unawareness of their surroundings at music festivals. The speaker then explains the concept and makes the analogy with the experience of sitting around the fire. Following up, the speaker explains the artefact's behaviour and how participants affect the light's behaviour. Lately, he has asked for consent for the test to be recorded.
- **Part 2. Free interaction and festival experience questions.** Participants are welcome to explore the installation and sit on the pallets. This stage is purely informal and observational. The speaker asks open-ended questions about music festivals and the relationship that participants have with them. The questions were:
 - Why do you usually go to a festival? Have you been to a music festival before?
 - Is meeting new people important to you at festivals? (Not at all – A little – Neutral – Important – Very important)
 - Do you value having places to rest? Why?
 - How do you feel about people recording with their phones at festivals?
- **Part 3. Testing the light.** Using the method Wizard of Oz, participants are invited to sit on the pallets one by one. The purpose is to test how participants perceive the interaction with the light. The questions were:
 - Is the interaction clear for you?
 - Imagine this by night, how would the light effect make you feel?

- Does the light and the design of the structure feel inviting?
- Do you find the space safe and comfortable?

- **Part 4. Discussion about group dynamics and the scalability factor of the installation.** Discuss how the modular aspect of the installation and the addition of multiple units support social dynamics between multiple groups of friends. Participants were presented with the pictures in Figure 23.
 - Does the setup and the interaction with the light promote approaching strangers?
 - Would you feel comfortable having another group of friends in the unit next to your group?
 - Does the space (referring to configuration with multiple units) feel like a place to relax, reflect and connect with people?

- **Part 5. Improvements and suggestions.** The purpose of this part was to summarise findings and draw conclusions. Also, take the chance to share any additional thoughts regarding the installation of find more suggestions for improvement.
 - What would make this installation more inviting or engaging? Any features you'd add or remove? Any additional comments?

The user test plan in detail can be found in Appendix 2.

Participants were asked for consent to be recorded both by video and audio, and to appear in the images presented in this document.

5. RESULTS

The results are presented in chronological order.

5.1 Look and Feel Prototype



Figure 40. Look and Feel prototype.

5.2 Results from the User Test



Figure 41. Images from the user test.

Two User tests were conducted. The first one with 5 participants and the second one with two participants. Tests were conducted on different days but under very similar weather conditions. A full transcript of both tests and a video can be found in Appendix 3.

5.2.1 User test 1

PART 1. Introduction.

PART 2. Free interaction and festival experience questions.

- Why do you usually go to a festival?

The main reasons were good music, interest in the artists who are performing, sharing the experience with my group of friends, getting drunk and disconnecting from everyday life.

- Is meeting new people important to you at a music festival?

Some people said “depends”, especially for those going with their family or partners. Others said it is nice to meet new people, especially in countries like Denmark, where interacting with strangers is not very common. It was noted by some of the participants that through design it the interaction with strangers can be encouraged.

- Do you value having places to rest?

All participants strongly agreed that it is an important aspect for them. Especially as people get older, they need a break sometimes between the concerts. “

- How do you feel about people recording with their phones?

For some, it wasn't something that bothered them. For others, it was a bit annoying, especially if they end up appearing in videos, but they accept it as part of modern life. A debate started here on how the creation of a digital identity and sharing the experience

through social media disconnect people from the present moment. “Nowadays we are hyperconnected and paradoxically more disconnected from others”.

PART 3. Testing the light.

- Is the interaction clear enough?

The interaction wasn't clear enough during the day. Participants imagined that it might be obvious at night. However, they were a bit concerned about drunk people completely missing the interactivity aspect and the point of the installation.

Here, a discussion was raised about the colour of the light. Red was perceived as an alarming colour by one of the participants. They'd have preferred orange, yellow or blue. Participants here suggested the idea of playing with changing the colour of the light depending on how many people sit around. The duration aspect of the light was also brought up at this point. They commented that it was an interesting feature, but it might be annoying on some occasions. They gave the example of sitting with your couple at the installation because it is perceived as cosy and romantic, but suddenly the light fades away. That couple probably won't feel like inviting someone else to bring the light back to life.

- Does the light and the design of the structure feel inviting?

Participants agreed that it does, especially for small groups and that promotes face-to-face interaction. Here, participants made some suggestions: adding cushions for achieving more comfort, making the surface of the pallets smoother to prevent damaging clothes and splinters and varnishing the surface for a nicer look.

- Do you find the space safe?

Here, some concerns were raised regarding people getting drunk and having different heights in the structure. It might be slightly dangerous, and people may step into the gap where the light is located. They saw the gap as a potential place for people to throw away their trash. Additionally, since there are gaps between the wood planks of the pallets, participants were concerned about people losing their keys or phones getting stuck between the pallets.

On the other hand, they found the design intimate since it has walls around and the configuration promotes sitting close to each other.

PART 4. Discussion about group dynamics and the scalability factor of the installation.

- Would you feel comfortable joining others who are already sitting?

When referring to the configuration with multiple units. Participants shared that this configuration seemed a little intimidating and complex. They mentioned that they could feel a little worried about entering the installation if people were drunk or partying inside. The

preferred configuration is with just 4 units for this matter, since fewer people make the approach to strangers more manageable.

They brought up here that the installation should be close to food trucks, walkaways or places where there is already something going on, since it will make it easier for people to stop by. Especially regarding having food, it makes the installation the perfect place to sit down and eat.

They suggested having different colours of light assigned to the units. So they could form teams (blue team, green team, red team), so they could easily be identified when they go back to the party.

They also mentioned that, in the case of having multiple units, it could be helpful to have walkways that can guide people through the structure. Those paths could be lit up as well.

- Does the space feel like a place to relax and connect?

Yes, especially thanks to the central light. It invites us to gather and be present. However, they felt the installation needed a clearer purpose: “Is it for relaxing, socialising or for both?”.

PART 5. Improvements and suggestions.

- Are there any additional comments or suggestions for improvement?

There were no additional comments in this user test. They discussed the possibility of having a speaker but rapidly changed their mind since they realised that in a festival context, there is probably going to be a lot of music already in the background.

5.2.2 User Test 2

PART 1. Introduction.

PART 2. Free interaction and festival experience questions.

- Why do you usually go to festivals?

The main reason for both participants was the music. They didn't show any particular interest in meeting new people; instead, they just wanted to enjoy the festival with their group of friends. One of the participants has gone alone previously to a music festival, but it was solely. In their view, they mentioned that festivals don't foster meeting strangers.

- Do you value having places to rest at a festival?

Both participants agreed that it was very important for them. They appreciated having some time to rest from the overstimulated of the stage and the mass of people.

- How do you feel about people recording with their phones?

They were neutral regarding this matter. It wasn't something that seemed to bother them. In their case, they don't usually record with their phone or share on social media, they prefer being in the moment, enjoying the music.

PART 3. Testing the light

- Is the interaction clear enough?

They found the interaction very clear, especially at night. They were concerned about the installation being too dim when no one is sitting there. They mentioned it could be perceived as unsafe.

- Does the light and the structure feel inviting?

Yes, found the installation inviting, and they agreed that it has the potential to encourage people to make new friends and invite people in. To them, the fact that the light changes can open up the conversation.

Regarding the light itself, they shared that red is a nice colour, but that orange or yellow may be more linked to the fire. Making it easier for the user to understand the analogy.

- Does the space feel inviting and safe?

They were a bit concerned about the LED light tube being exposed. They suggested instead of having a single light in the middle, embedding the lights around and in between the pallets. Having multiple lights working in the same way.

PART 4. Discussion about group dynamics and the scalability factor of the installation.

- Would you feel comfortable joining others who are already sitting?

They say yes, but depending on their state, whether they were drunk or making a lot of noise. To them, the design encourages gathering within groups while also making socialising with nearby groups easier.

- Does it feel like a place to relax and connect?

Yes. The installation was perceived as a refuge from the sometimes chaotic festival environment.

PART 5. Final thoughts and suggestions.

Participants emphasised the safety concern. One of the participants was a mother and she found the configuration with multiple units fun for them, but at the same time, she was concerned about her kids falling, perceiving the gap for the light risky.

Lately, they shared that the material fits the vibe of a music festival, usually using sustainable materials and rustic designs. They liked that it was simple and rugged, although they had some concerns about splinters.

5.2.3 Findings from the user tests

- Music and hanging out with your group of friends are the top motivations for users to attend a music festival. Although they are open to meeting new people. They mentioned that music festivals don't always offer points for promoting social interaction.
- People felt generally neutral about others' recordings with the phone. They accept it is part of modern society.
- The light interaction is understood and appreciated. Although it could be clearer during the day.
- The duration aspect of the light, depending on how many people were sitting, was perceived as disturbing by some.
- There were suggestions given about playing with the colours of the light. Especially when talking about having multiple units.
 - Different colours for the light could also promote social interaction between groups of friends.
 - Red was perceived as a colour that indicates danger by some. Orange, yellow or even blue tones might be more inviting.
- The installation is perceived as a place to rest and to socialise.
- The installation is generally considered a safe and comfortable space, although a lot of suggestions were given on how to improve this aspect.
 - Varnish the wood to avoid splinters or damage to clothes.
 - Cover the gaps between the wood planks of the pallets and protect the light source.
 - Add cushions or blankets to make the seats more comfortable and cosier.
 - When referring to the design with multiple units, the different heights of the installations are perceived as dangerous for kids and drunk people.
- People are comfortable sitting next to other groups of friends as long as some separation always remains.

- The design with many units was perceived as intimidating, more dangerous, confusing and less inviting for social interaction. Whereas the one with 4 units was more welcomed when talking about interacting with another group of friends.
- Some other suggestions were:
 - Placing the installation close to food trucks or areas where there is already something going on, so people will be more likely to sit on the pallets.
 - Having lights around the pallets instead of one central light.
 - When referring to the installation with multiple units, light was suggested as a way to guide people through the installation.

5.3 Implementation Prototype

Based on the findings extracted from the user test, two modifications in the design were made:

- The first one was to cover the light source with a translucent case, so the light is protected and the gap around it is reduced, trying to avoid the risk of someone falling inside the hole.
- The duration variable of the light, depending on how many people were sitting, was decided to be removed. Although it was intended to act as an excuse to invite more people to join, it was perceived as something disturbing that might trigger people to leave the place. Instead, the light will light up accordingly to the number of people as long as they are sitting or standing on the pallets.

A video of the implementation prototype functioning can be found in Appendix 4.



Figure 42. Implementation prototype.

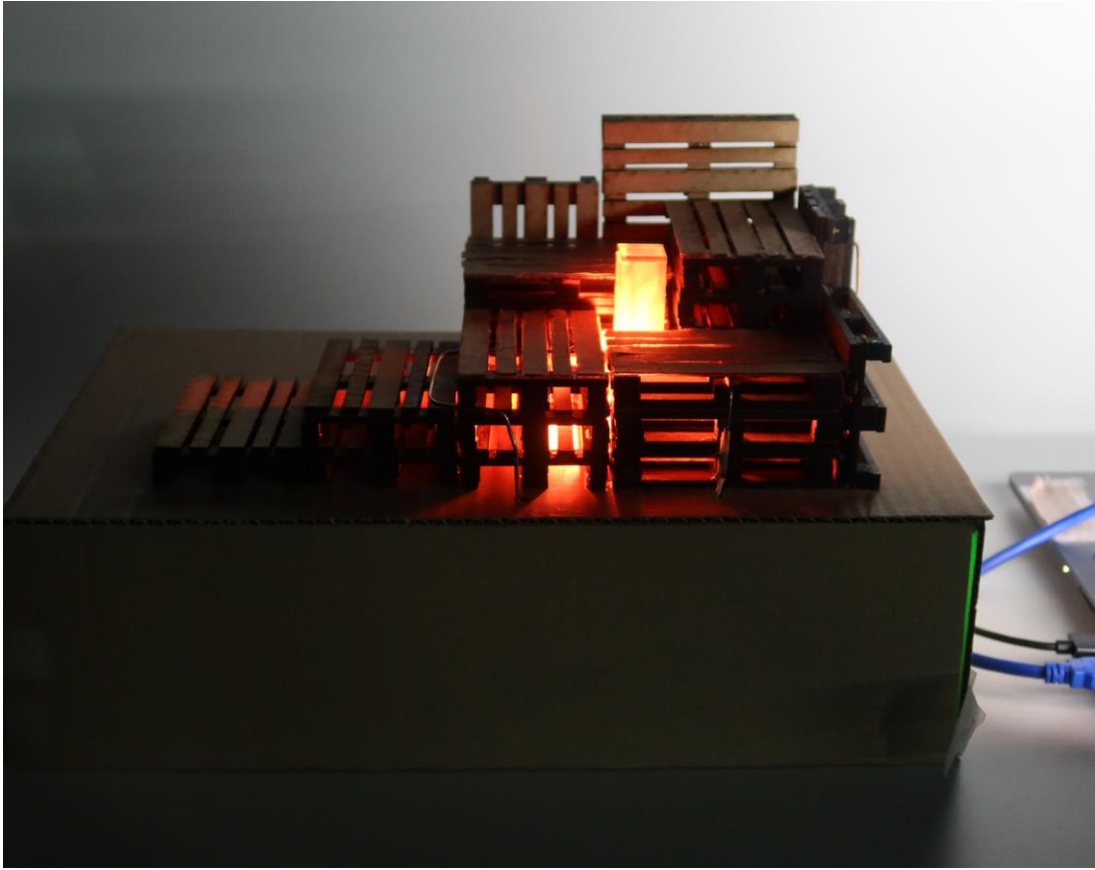


Figure 43. Implementation prototype functioning.

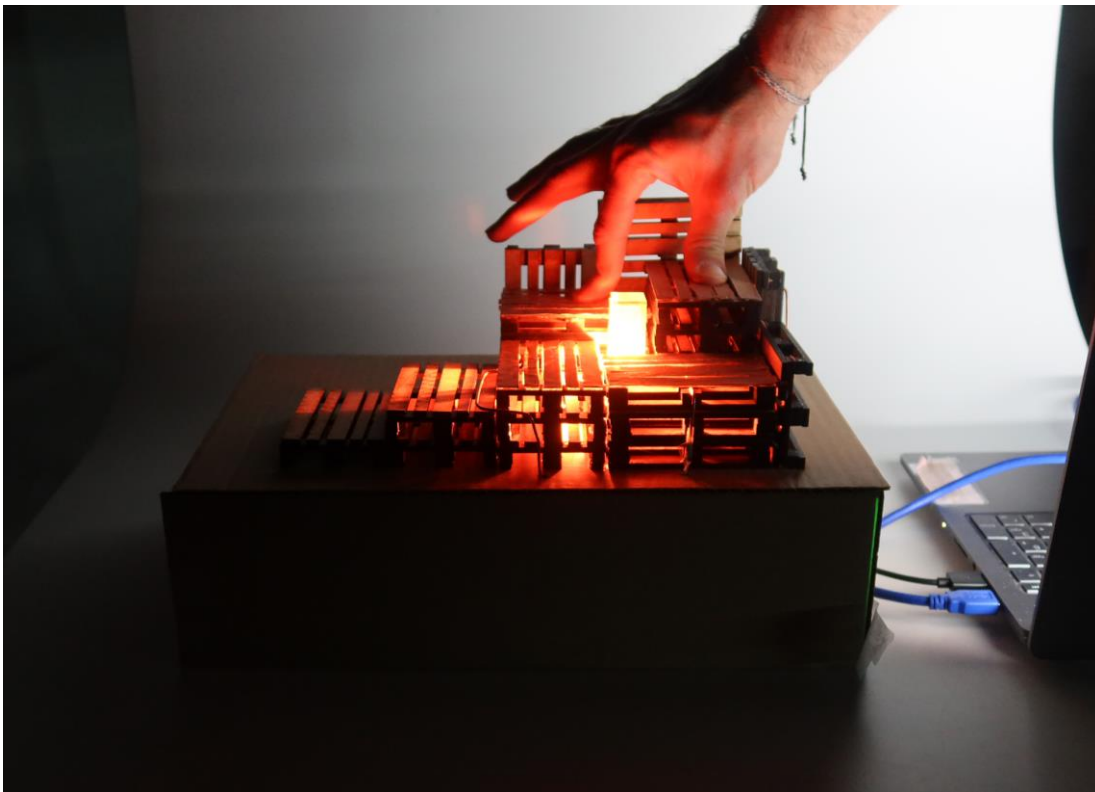


Figure 44. Implementation prototype detecting two touch points.

6. EVALUATION/DISCUSSION

6.1 Research question

The project started with the following research question:

- How can an interactive art installation be designed with Mellow Designs' pallet system to promote social interaction and presence at music festivals, in contrast to the overstimulating visual performances that isolate attendees?

To answer this question, the paper first presented literature on interactive art installations and particularly focused on presenting examples that foster social interaction. The author found that there is no literature or previous examples of interactive art installations that focus on the problem addressed by this work. Besides, with the increasing popularity of social media platforms and the extensive use of smartphones, people sometimes spend more time recording the performance to share online rather than enjoying the experience and being present. Hence, the goal of the project was, by taking previous literature and the examples as a source of inspiration, to design an art installation that brings presence and fosters human connection.

To achieve that, the project initially focused on ubiquitous interaction, where there are multiple focal points, the interaction is subtle, and there is an objective of opening up conversation. This type of interaction promotes exploring the environment and seeks collective participation. To create a positive experience, the paper presents the methods of the Checklist for Concept Generation, Definition of emotional goals and Definition of design strategies, rooted in the theories of Emotional Design, Experience Design and Design for behavioural change. These methods guided the design decisions and allowed the author to not lose track of the main objectives of the project throughout the whole process.

After conducting a user test, it is believed that the art installation successfully promotes social interaction and brings presence through:

- Its circular design with a focal point in the middle that invites people to gather around the light. People are sitting close to each other and see each other's faces, which promotes social bonding. At the same time, there is a balance between privacy and sociability, people have a sense of personal space while still being close enough to each other to connect.
- The interaction with the light encourages collaboration and opens up conversation, possibly encouraging approaching strangers and making new friends. Users are actively shaping the experience as a group, and the effect of doing something together brings presence and increases the feeling of connection.
- The use of warm colours. Orange, red and yellow tones create a cosy atmosphere that feels inviting, secure and intimate.
- The back support of the seats, arm rests, and different heights are perceived as indicators that the art installation is a place to rest and relax.

- Users can relate the art installation to the experience of sitting around the fire, evoking similar feelings in them. This association taps into cultural associations that are often linked to warmth, connection, safety, nature and shared experiences.

6.2 Positioning the concept within Design theories

The design solution is rooted in the theories of Design for Emotion, Experience Design and Design for Behavioural Change.

When referring to Design for Emotion, D. Norman emphasised the importance of designing considering the emotional aspect of a product. By creating positive emotions, the user might establish a deeper connection with the product. D. Norman presents three different levels regarding how affection develops.

- Regarding the visceral level, the use of warm amber light and wood makes the place feel secure and inviting a first glance.
- In the behavioural level, the installation rewards collaboration by providing more light, creating satisfaction when sharing the experience.
- In the reflective level, users associate the experience with the activity of sitting around the fire, making a connection with their previous experiences, often associated with a sense of community and relaxation.

Hassenzahl, with Experience Design, focuses on creating meaningful experiences. By creating a meaningful experience when interacting with the art installation, users will have a good memory and a story to tell, which in consequence contributes to the overall positive experience of the festival. Hassenzahl argued that it is important for designers to have an idea of the experience they want to create before jumping into ideation (Hassenzahl, 2010). This was done through the Definition of Emotional Goals and the Definition of Design Strategies. After conducting the user test, the design solution generates the intended emotions in the users.

- The sensation of warmth comes from the resemblance of the light to fire. The colour temperature range between 1800K and 2200K makes users feel relaxed. Although the colour red was perceived as alarming by some.
- Presence is provided by the effect of the light. It is simple and not overstimulating, making it non-distracting while being a potential factor for starting a conversation.
- Connection comes from the interaction with the light and the disposition of the pallets, which invites to a social gathering.

It is possible to confirm that, according to Hassenzahl in Experience Design, there is an alignment between intent, design and experience.

The outcome of the experience creates a behavioural change without imposing rules. It does so by rewarding collaboration and tapping into the analogy of sitting around a fire. The design solution, with its features that transmit calmness and presence, has the potential to stand out from the hectic environment of the stage, taking the users from recording with their phones to connecting to others. However, in order to affirm these statements with certainty, it would be important to develop a user test in the context of a music festival.

6.3 Performative vs. Ubiquitous Interaction

After conducting a literature review, it was concluded that the stage was a performative art installation by itself. Where there is a huge focal point, there is one person or a reduced group of people performing, and it provides a social gathering by people taking the role of spectators. Therefore, it was decided, for the design contribution to be noticeable and have an impact to focus on ubiquitous interaction instead. However, the design solution ended up being a mix of those two types of interactions. The interactive art installations examples provided in this paper fall under one category or the other, but as Luke Hespanhol and Martin Tomitsch in *Designing for collective participation with media installations in public spaces* argue, those two types of interaction are not mutually exclusive; it is possible to have art installations that present the qualities of both (Hespanhol & Tomitsch, 2012).

The design solution presents the qualities of performative interactions in the sense that there is only one focal point that makes people gather. However, there isn't one particular person performing. Instead, everyone is collaborating equally to shape the experience, which is a typical characteristic of ubiquitous interactions. Moreover, participants in the user test described the interaction with the light as clear, instead of ambiguous, which is common in ubiquitous interactions. The interaction with the light is subtle in the way it transitions between the different intensities. It slowly fades in and out as soon as someone joins or leaves. So, there is clearly a mix of the attributes of both types of interactions in this case.

Table 2. Categorisation of the different attributes of the design solution.

Attribute	Description	Interaction type	Reason
One focal point	Having one warm light in the middle draws people's attention to a single focal point.	Performative	Performative interactions present one focal point.
Who shapes the experience.	All participants engage equally in shaping the experience	Ubiquitous	Shared control is typical of ubiquitous interactions.
Clarity of the interaction	Interaction is clear and easy to understand.	Performative	Performative interactions are characterised by clear cause and effect.
Qualities of the interaction	Light fades gently in or out.	Ubiquitous	The soft transition blends into the environment instead of demanding attention.

As the concepts scale up by adding multiple units, it is believed that the installation will have more commonalities with the ubiquitous type of interaction since there are then multiple focal points. Especially if some of the suggestions given during the user test are applied in the future. For instance, if different colours are implemented as suggested, then colours could be used to connect groups of friends, or the colours could indicate how many people are sitting in each unit, creating then a more ambiguous sort of interaction.

6.4 Alignment with the stakeholders

The design solution fits the company values presented in Brand DNA and the characteristics of the Mellow Designs product family. The art installation can be built using the Mellow Joint, it is modular, scalable and customizable.

The art installation fits the theme of the Karrousel festival since it provides a dreamy and cosy ambience that invites people to gather and reflect, common characteristics of the art installations often exposed in this festival, see Figure 1. However, the performative aspects of the art installation allow it to be exposed in any kind of festival, since it does not particularly use the elements of the surroundings.

Although the concept wasn't tested at a festival where festival goers can be interviewed. All participants involved in the user test had previous experience in going to music festivals, and the conclusions extracted from the user test are considered to be valid. Ideally, regular festival goers should be interviewed since they have more experience than the average person, and their feedback could be very insightful.

6.5 User Test

The prototype successfully met the expectations, and the installation was positively received by the participants. Although participants didn't seem bothered by the constant use of phones during festivals, they were able to relate to the problem and acknowledge the need for resting areas and spaces to socialise. Meeting strangers wasn't the main goal for participants to go to a music festival, as it was expected. However, they seemed to be open to the possibility of making new friends and agreed that the installation would promote that aspect, especially with the 4-unit configuration. The analogy of gathering around the fire and the meaning of the interaction with the light was well-received by the participants, and they seemed to like the concept. Although they propose certain refinements and suggestions regarding the qualities of the light and safety.

After the user test, it is concluded that the installation had the potential to be attractive for festival goers and therefore enhance the overall experience of a festival.

6.6 Future lines of work

Future lines of work should focus on testing the implementation prototype on a real scale, since that one already applies some of the changes suggested by the participants. It would also be interesting to test how the flickering effect or the orange colour is perceived. But mostly, there is a big interest in testing the 4 units configuration, having more participants and different groups of friends. With the goal of observe how people feel about having strangers around and if the art installation truly fosters the desired social interaction. Additionally, it will also be interesting to explore how to connect the units through the interaction between the lights and see if that could be a way to promote connection.

The sensors used in the implementation prototype were touch sensors, since the top planks of the pallets were flexible and made out of plastic, allowing the creation of touch points when putting pressure on them. However, in reality, the top planks would be made of wood and won't be flexible. So, the approach followed in the prototype could not be applied in real life. Future development of the project should focus on achieving a different way to detect how

many people are sitting on the pallets. It may require the use of a weight sensor load cell located on the top of the pallets or an infrared sensor to detect proximity. Some Arduino resources already present how to develop a digital scale or work with the infrared sensor (randomnerdtutorials), (Jain). Another implementation prototype should be made to test those sensors before jumping to a real-scale prototype.

Lately, safety concerns have been raised in both user tests. The main features that were perceived as potentially dangerous were the splinters, the gap between the wood planks and the hole in the middle for the light. Additionally, people were concerned about the art installation being a place for drunk people to gather and party, particularly for the configuration with multiple units, instead of being a resting area. The addition of some varnish to the surface of the pallets could improve the look while keeping its rough character and also minimise the risk of splinters. In the same lines, adding some soft surface on the top pallets could make the installation feel more comfortable while covering the gaps between the wood planks. The addition of cushions and blankets could make the installation feel more inviting. However, it is important to take into consideration that the installation is going to be in an outdoor environment, and weather conditions may damage those components as well as the food or drinks that people often carry.

6.7 Limitations

Initially, the Look and Feel prototype was planned to be assembled at the Valborg celebration in Lund, Sweden, since it is a place close to Malmö, the event presents the characteristics of a music festival, and it could have been possible to test the concept with multiple participants. However, this required renting a van to carry the pallets, a third person or company to buy or rent 27 pallets from, and a space at Lund to assemble the structure. This could have been done with some help, but it would have implied more management and resources. Instead, since the author had access to pallets at UNICEF, it was the less complicated option to assemble the prototype there, and similar results were expected for the user test. Once again, in the future, the prototype should be tested in a festival setting or under similar conditions.

Another limitation was that the prototype was tested on a sunny day. The prototype couldn't have been tested at night because people are not at the place at that time.

7. CONCLUSION

Research through Design is an approach for doing research where the design practice becomes a way for creating new knowledge. The project generates new knowledge by investigating how users perceive the problem presented and how to foster human connection through the use of light in a festival context. It was discovered that users generally don't seem to be bothered by others recording with their phones, but they acknowledge that there is a need for having resting areas and places to socialise at music festivals. The art installation developed in this project is presented to fulfil that interest and to criticise the constant need for overstimulation in today's society. Although the solution doesn't criticise the problem directly, it does so by providing a space that is the opposite of what happens around the stage, by making an analogy with the old tradition of sitting around the fire. This is believed to be something that every person can easily relate to, and that by having this tradition as an

inspiration, it is possible to evoke the same emotions with the art installation. The results of the user test confirm that assumption.

The project follows a Research through Design approach by Building, Reflecting and Refining on a design artefact. An iterative loop commonly seen in Research through Design approaches (Lewis et al., 2020). It Builds by the creation of the Look and Feel prototype, it Reflects by conducting a user test, where observations and questions were made, and it Refines by using those reflections to improve the concept. The project contributes to academia by:

- Reflecting on the qualities of the light. How to make it subtle yet easy to understand, while avoiding overstimulation.
- Reflecting on the emotional perception of structures made out of pallets, not only on their functionality.
- Reflecting on how to bring presence and calmness in a chaotic environment.

To conclude, the project indicates that it is possible to bring presence and shift the focus from the screens to the present moment by creating an art installation that promotes a shared experience through the use of light. Although the art installation should still be tested in a festival context, and at night. Beyond music festivals, it is possible to imagine how this installation could be used broadly in overstimulating venues such as big squares or busy streets, where there could also be a need for calmness and presence. Additionally, it could also be interesting to explore the concept with kids in a playground environment, since it was something that came up during the user test. Kids may find the concept fun, especially the one with multiple units. Although proper adjustments regarding safety should be taken into consideration when moving in this direction.

The art installation created in this project invites us to reflect on the excessive use of technology and on how humans go to music festivals sometimes with the motivation of sharing the experience through social media. This constant connection to the internet and the need for overstimulating media extend beyond festivals. It can be seen in the metro, in the parks, in the school, in the library, etc., and it makes humans lose their focus and forget about the importance of the people around them. Art installations like the one presented in this project are an invitation to come back to our roots. To put down the phone, appreciate the people around us, and take a moment to pause and reconnect with the present moment.

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APPENDIX

1. Arduino code

```
#include <Wire.h>

#include "Adafruit_MPR121.h"

#include <Adafruit_NeoPixel.h>

#ifdef _BV
#define _BV(bit) (1 << (bit))
#endif

#define NUMPIXELS 8

#define LIGHT_PIN 6 // Using only one light stick at pin 6
Adafruit_NeoPixel stick(NUMPIXELS, LIGHT_PIN, NEO_GRB + NEO_KHZ800);

/* ----- MPR121 Capacitive Touch Sensor ----- */
Adafruit_MPR121 cap;
uint16_t touchBits = 0;

/* ----- Breathing Params ----- */
const float SPEED = 0.005f; // Controls pulsation speed
int pixelsToLight = 1; // Tracks number of pixels lit
float brightness = 0.5; // Stores fire brightness for transitions
```

```
unsigned long lastUpdate = 0; // Helps control refresh rate
```

```
/* ===== */
```

```
void setup() {
```

```
    Serial.begin(9600);
```

```
    while (!Serial) delay(10);
```

```
    stick.begin();
```

```
    stick.clear();
```

```
    stick.show();
```

```
    if (!cap.begin(0x5A)) {
```

```
        Serial.println("MPR121 not found!");
```

```
        while (1);
```

```
    }
```

```
    Serial.println("MPR121 ready!");
```

```
}
```

```
/* ===== */
```

```
void loop() {
```

```
    if (millis() - lastUpdate > 50) { // Limit updates to every 50ms
```

```
        readTouch();
```

```
        showFire();
```

```
        lastUpdate = millis();
```

```
    }
```

```
}
```

```
/* ----- readTouch() ----- */
```

```
void readTouch() {
```

```
    touchBits = cap.touched(); // Read touch sensor state
```

```

// Count how many touch points are active
int touchCount = 0;
if (touchBits & _BV(6)) touchCount++;
if (touchBits & _BV(5)) touchCount++;
if (touchBits & _BV(4)) touchCount++;
if (touchBits & _BV(3)) touchCount++;

// Assign levels based on number of touches
switch (touchCount) {
    case 4: pixelsToLight = 8; break; // Level 4 - Four touch points
    case 3: pixelsToLight = 6; break; // Level 3 - Three touch points
    case 2: pixelsToLight = 4; break; // Level 2 - Two touch points
    case 1: pixelsToLight = 2; break; // Level 1 - Any one touch point
    default: pixelsToLight = 1; break; // Level 0 - No touches
}
}

/* ----- showFire() ----- */
void showFire() {
    static float intensity[NUMPIXELS] = {0}; // Stores brightness levels per pixel
    float flicker = random(-2, 2); // Adds subtle variations
    brightness = (sin(millis() * SPEED * PI) + 1.0f) * 0.25f; // Smooth fire effect

    uint8_t rBase = 180 + brightness * 60 + flicker; // Fire red range (180-220)
    uint8_t gBase = 50 + brightness * 40; // Yellow-orange (50-100)
    uint8_t bBase = 10 + brightness * 10; // Minimal blue tint (10-40)

    for (uint8_t p = 0; p < NUMPIXELS; p++) {
        if (p < pixelsToLight) {
            // Gradually increase intensity for newly activated pixels
            intensity[p] = min(intensity[p] + 0.02, 1.0);
        }
    }
}

```

```

} else {
    // Gradually fade out inactive pixels
    intensity[p] = max(intensity[p] - 0.02, 0.0);
}

// Apply smooth brightness scaling
uint8_t r = rBase * intensity[p];
uint8_t g = gBase * intensity[p];
uint8_t b = bBase * intensity[p];

stick.setPixelColor(p, stick.Color(r, g, b));
}
stick.show();
}

```

2. User test plan

Hi! Thank you for joining. I'm Adrian, for those that I haven't met yet, I am doing an internship here in graphic design, updating the images of the product catalogue. I am studying a master's in Malmö, it is called interaction design, and today, thanks to Monica, Fady and Charly, I am testing my thesis prototype for my thesis project. I do it with a start-up in Copenhagen that does furniture with pallets for music festivals. Since I needed to do something interactive, I created an art installation using their system for fixing the pallets together.

So, with the project, I am aiming to address a problem that I see in music festivals nowadays. In a music festival, the scenario looks amazing, with so much light, fire, confetti, fireworks, you name it. And in my opinion, I think it looks very cool, but it is also a distraction, since lately with social media, everyone is recording with their phone and focusing only on that specific point. Missing the part of interacting with the people around and opening up the possibility of making new friends. Besides that, many lights and loud music can be overwhelming after a while and at least for I need a rest sometimes.

So, what I have created is rather a space for chill out, talk to each other and open up the possibility to talk to others as well. It is inspired by the old tradition of sitting around the fire, playing games, telling stories around it, playing music, etc.

As you see, there is a light in the middle that represents the fire. There are supposed to be some sensors on the pallets that detect how many people are sitting around.

- If I am sitting just by myself, the light will light up, but it will be very dim.
- If someone else comes, it gets lighter and it also lasts longer.
- If one more person joins, then it is even brighter.

So, the more people join, the longer it lasts and the brighter it gets.

The testing is going to be divided into three parts:

-First, you are free to sit down, enjoy some Spanish omelette and some chorizo. And I will be asking you some general questions about festivals.

-In Part 2, we are going to do a test with the light where we will be sitting one by one and see how the light reacts. I am going to control it manually since we don't have the sensors here.

-Lastly, I will be asking some questions regarding the interaction aspect and also the social aspect.

Does everyone feel fine with me recording audio and video?

Part 1 - Free interaction & Q's festival experience.

You can interact with it freely. Feel free to sit, talk, or relax. I'll observe quietly, and I'll be asking some questions. Feel free to take some Spanish omelette. Is it okay if I take notes or record video/photos for documentation? (Get verbal or written consent.)

- Why do you usually go to a festival? Have you been to a music festival before?
- Is meeting new people important to you at festivals? (Not at all – A little – Neutral – Important – Very important)
- Do you value having places to rest? Why?
- How do you feel about people recording with their phones at festivals?
-

Part 2- Light interaction - Video

First, I sit down just by myself. Turn On the Light.

Some approaches and sits next to me, I regulate the light.

Someone else.

A fourth person.

- Do you find the interaction clear enough?

Imagine this is by night, how would the light effect make you feel?

- Does the light and the design of the structure feel inviting?
- Did you feel safe and comfortable sitting here?

Part 3 - Social aspect

First, you show the modularity aspect and explain that different groups of friends can be sitting around.

- Would you feel comfortable joining if others were already sitting?

Let's say you are sitting with your group of friends in this unit and there is another unit located right next to it. Would this space help you feel more comfortable approaching strangers?

- Last question, does the space feel like a place to relax, reflect and connect with people?

Improvements & Suggestions

- What would make this installation more inviting or engaging? Any features you'd add or remove? Any additional comments?

3. Link to User Test Transcript and Video

https://drive.google.com/drive/folders/1v8jAM4i45xdxlwa8nS_JpBczI9BdkN3P?usp=sharing

4. Link to Implementation Prototype Video

<https://drive.google.com/drive/folders/1HraSaGslfMofqXxxcD6SPmrOZPNROIHs?usp=sharing>