SOCIAL INTERACTIONS WITH SHARED SYSTEMS

PROJECT REPORT

Q and I

Listening together.

Project Slot: *Sep, 2018 - Jan, 2019*
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Q AND I

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EXECUTIVE SUMMARY

This report covers the process of a design project carried out within the domain of Social Interactions with Shared Systems. It entails how “Q and I", a speaker enhancing shared listening experience, was designed from first explorations to the final design. Along the way, insights are presented which lead to a divergent collection of iterations. Also, all the decisions that contributed to these iterations are shared, as well as how these decisions were validated through multiple user tests. The final prototype will be described in detail. Finally, future opportunities to explore different concept features, settings and scenarios are described.

1 INTRODUCTION

1.1 SQUAD DESCRIPTION

The so-called project squad focuses on interaction design of systems which are shared by multiple users, as well as the user experience while interacting with these systems. It combines the everyday life of users with theoretical knowledge from psychological and social studies as the basis for design methodology. In the following section we describe how we explored this domain.

1.2 PROJECT KICK-OFF

By doing an intense design sprint within the time-span of two weeks, familiarity with the squad, as well as understanding of terminologies used within the squad were gained. In the first week, this was set up to collect and analyze pictures of different types of shared systems. In the second week, a shared system was acted out in a detailed manner, looking thoughtfully at how users (e.g., actors and audience) interact with such a system. For this part of the so-called pressure cooker, the Sonos One speaker was examined. We learned about the dialogue between system and user, and how we could improve this dialogue by providing the right social and system information at the right desired times. This honed our sensitivity to find opportunities where this information was lacking.

After the 'pressure cooker', four topics emerged as an initial interest for the follow up of the project. These topics were: shared office lighting, lighting in the home environment, shared music systems and thermostats. Within each topic, current available high-end products were and analyzed by mapping each product on a graph. The x-axis was ranked on intelligibility, and the y-axis was ranked on social translucency. Where social translucency was defined as how much information about others was available through the interface of the device and intelligibility was defined as how much information about the system status was available. Eventually, we decided to go for the topic of music as we saw many existing products were coming short on social translucency, which we saw as opportunities for improvements concerning sharedness and intelligibility.

2 IDEATION

2.1 FIRST IDEATION

After the learnings of the pressure cooker, the first concepts were generated based on shared music environments. Several contexts and scenarios were identified (e.g. study associations, sports canteens, hostel lobbies). With those multiple contexts in mind, concepts were shaped individually, which were collaboratively discussed quickly afterward. One of the concepts that we thought of was a wall-mounted music system, where more and more information would moderately become visible when approaching. This information shifted from only genres/vibes represented in the queue to all queue information itself (Image 1).

Image 1 Wall-mounted music system

To further explore shared music systems in open spaces and to evaluate the strength of the previously described concept, two small ethnographic explorations were executed. One in the public area of the study association of the Industrial Design department (Image 2) and the other one in the canteen of the Student Sports Center at .

Image 2 Study association space

The goal of these explorations was to observe people's behaviors while they were present in those spaces. There was a focus on the intentions of each actor, as well as what role music played for them, within the setting. In each open space, we noticed that actors could be divided into 'authorized' and 'unauthorized' actors. Authorized actors are the ones that have control over the music system or own the music system. Unauthorized actors are other people present in the space who would have to request changes to the authorized actors. An interview with one of the 'authorized' actors revealed that changes in the music were only made whenever the currently playing music was considered as disturbing or not fitting the current atmosphere. *"We put on some music on the beginning of the day and leave it as long as it is not disturbing." - K.* In a separate interview, an 'unauthorized' actor confirmed the statement: *"I don't really notice the music as long as it is not too distracting. [...] I kind of like it that I can't change it, it feels like a café" - L.* Neither of the two groups interacted explicitly with the music during both observations.

Doing these observations revealed that our concept did not fit its intended context. From the interviews, we learned that there was little need for improvement.

Nevertheless, we argued the difference in detail of presented information from different distances was valuable and applied it in our final concept by creating two interfaces (see section 3.6) , keeping in mind the notion of interaction-attention continuum (Bakker & Niemantsverdriet, 2016).

2.2 SECOND IDEATION

As described in the previous section, the concept we drafted did not fit the observed contexts. This made us look back at the other identified contexts. One of which was the lobby of a hostel. The analysis unraveled two topics within this context; noise disturbance and sharing music. Multiple extensive scenarios were made for both of these topics, which resulted in a range of concepts. One of these was a wall-mounted display, that could visualize the amount of volume produced by guests in

Image 4 Noise disturbance concept

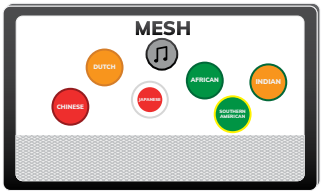


Image 5 Music sharing concept

the lobby and abstractly show how far that noise would travel (Image 4).

The people who are in their room could indicate whether or not they were affected by the sound in the lobby. Guests in the lobby could decide, or not, to adjust their volume appropriately. Whenever they would not, any guest could come to the lobby and hold them accountable, and the display could support their discussion.

However, we believed there are more effective measures to counter noise complaints, that would be more realistic to implement. Nevertheless, we found it valuable to design a product that would be able to support discussion, by giving people leverage. Only having it show information, would leave the decision making for humans which is one of our strengths.

As a second concept, we thought of a music player that would recommend songs based on the nationalities of the residents (Image 5). This concept could bring strangers together sharing music from their cultures. However, we ought it to be doubtful that one would approach a stranger and ask them to listen to a song. This is more common for people who know each other because they share a history and are familiar with each other's preferences. Therefore we decided to move away from this concept and context.

2.3 THIRD IDEATION

In the previous paragraph, we explained that people would need a history with each other to share music meaningfully. This history and relationship to music are different for each pair or group of individuals. We noted that there were no platforms that would allow the efficient sorting of music like Spotify and the possibility of giving annotation to why one shares a song in one platform. We envisioned a platform that could (Image 6).

As an example, we envisioned this platform being used by a group of friends that would go on holiday (Image 7). During their trip they could collect songs in a playlist they would share, and annotate why they stored it. Another example, duo of friends who are both DJ's, might make a list in which they share songs and annotated which song fits another.

However, it was pointed out that this application was focused on individual experiences of people that are separated. Besides, we noted that each of these groups and moments has different specific requirements that are not fulfilled by the rather general platform we envisioned. This made us reconsider the context we tried to design for.

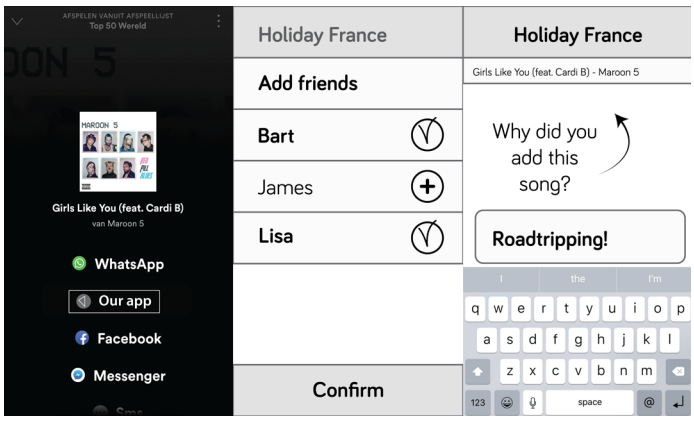


Image 6 Interactive prototype from third ideation

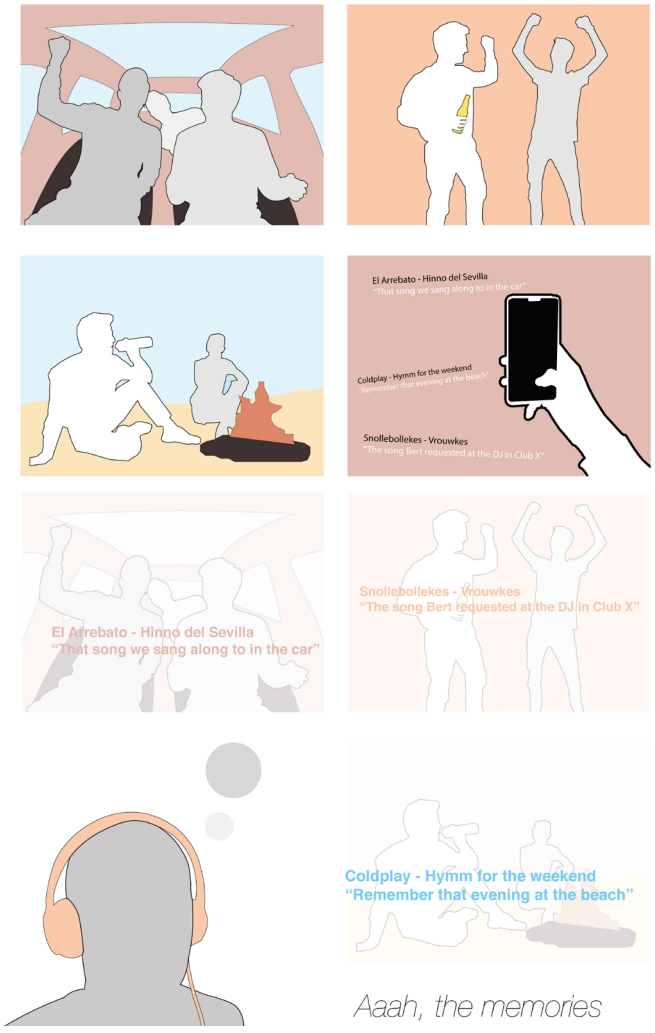


Image 7 Memorizing a nice holiday with friends by listening to songs representing situations

3 FINAL CONCEPT

3.1 CONTEXT DEFINITION

After reconsideration of the scenario, we decided to look at one of the particular moments of the "holiday" in our previous scenario and made that moment the context we wanted to design for:"A small group of friends ranging from three to ten people who hang out together while listening to music". We would focus on making information that is currently not readily available, more available to smoothen their selection of who could play what song at which moment. To investigate what types of information that could be, several scenarios were created, and the following types of information were identified: Intention, Urgency, Authorship and likability of a song. Intention was defined as "Why an individual wants to play that specific song?". Urgency was defined as "How relevant is the song to the conversation and thus how soon should it be played?". Authorship was defined as "Who wanted to play this song?". Likability of a song was defined as "How would the others like the song or how do they like it when it was played?".

"A small group of friends ranging from three to ten people who hang out together while listening to music."

In addition to this context definition, we took into account several elements that were seen as valuable in previous explorations, such as: Having a difference in detail of information depending on how focused the interaction with the device was and a design that would show information to help people make decisions.

3.2 PRELIMINARY CONCEPT

To explore how authorship, intention, urgency and likability of a song, lists were created with different types of media to express the information. These types of media were explored by sketching (Image 8). We quickly reasoned that likability was very hard to predict. For example, users may play different types of music in a similar setting with different people. Even in one evening, the mood may change drastically. To know if people liked the song required much attention of the users. They would have to rate each song or be equipped with biosensors. We did not see these as favorable situations and excluded likability of songs from our focus.

Besides, we argued that intention and urgency were heavily dependent on authorship. It was always someone who would have an intention or find something urgent. However, at this moment, we kept all three types of information into consideration.

From this reasoning, we drafted a preliminary concept (Image 9). It would be a speaker with a lighting interface on it, together with a detachable screen interface. The lighting interface on the speaker shows information on who put in which song in the queue. The detachable screen can be used to add profiles to the device.

When one has added a profile, they can browse for music or add, delete and rearrange music in the queue. Whenever one wants to add a song to the queue, they can put in their intention on why they put in this song. Moreover, they can attach a level of urgency to your song, indicating how important it is that it is played right now, rather than later. However, these two types of information should only be visible whenever someone would want to rearrange the queue. Therefore, they were only visible on the screen, whereas the authorship would be visible on the device itself. By showing social information of intention, urgency and authorship, a better shared listening experience is envisioned.

This preliminary concept was critically evaluated with the exploration-action model (Niemantsverdriet, 2018). With this, we identified key elements we thought we wanted to keep in our concept. Since the speaker is in a centralized spot, it is easy for everyone to approach the system's information at any time. It is easily visible who is present, what they are doing and who is interacting with the system, which can be referred to as social translucency (Erickson, & Kellogg, 2000). Any sound is easy to locate even outside the field of view. By presenting related information and the control elements near the source of the sound, they become easier to find. By looking at the device, users can see the status of the queue and if any changes have been made to it. Whenever the detachable screen is not on the device, the user has to explore the environment again. If someone else is holding the screen, it is clear who is currently in control.

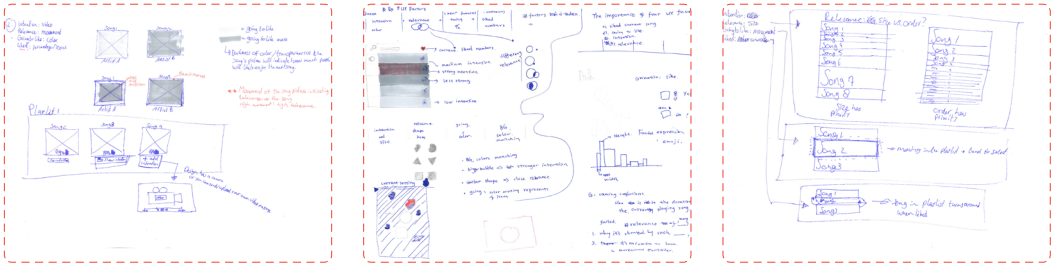


Image 8 Collage of pictures in which different information types are explored

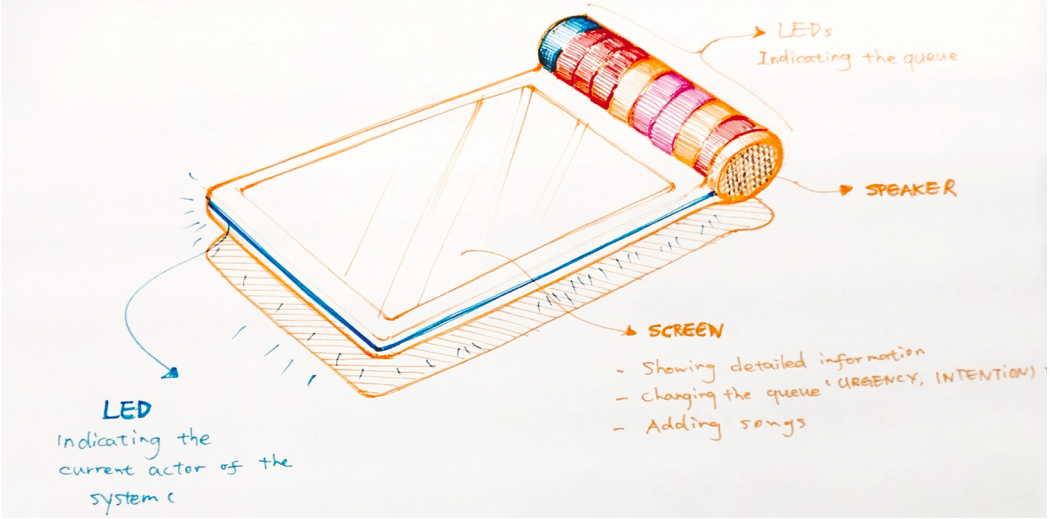


Image 9 A speaker with a lighting interface on it, together with a screen interface. The lighting interface on the speaker shows information on who put in which song in the queue.

3.3 TESTING

3.3.1 CONCEPT TEST

From the created list mentioned in section 3.2, we found that intention was best displayed through words because of the vast range and detail of the possibilities. Color or icons, for example, would be too ambiguous to understand without an explanation in words.

Urgency is best shown on a numerical scale. Therefore, we decided numbers would be the right way to display urgency.

We found using colors would be an appropriate and clear way to display the information about authorship. These findings were incorporated in a small test to verify whether or not the social information authorship, intention and urgency were correctly implemented in our concept.

We created a row of tokens that could hold paper slips (Image 10 & 11). On these slips, participants could write song requests. A researcher would input the requests in a Spotify playlist to arrange a queue to 'copy' the row of tokens and play the music.

To create a division in information available on the detachable screen and on the speaker, the slips had two different sides. On one side users could write song details and one of the types of social information (i.e. authorship, intention or urgency). On the other side, they could only write the social information.

Image 11 Tags and consent forms for testing

Image 10 Concept testing rack

Participants were asked to have lunch together to simulate a social setting. During their lunch, they could input songs and rearrange the tokens as they desired (Image 12). A session consisted of three rounds so that urgency, intention and authorship could be assessed in each session.

We found that urgency created feelings of discomfort like anxiety or mild aggression. Next to that, participants would rate their song as "most urgent" rendering the numbered scale useless.

Intention was experienced as too cumbersome. Participants explained that writing would, for example, disconnect them too much from any conversation they were having. When authorship was displayed, participants tried to divide the colors evenly.

These findings, combined with our previous insight of the dependency of intention and urgency on authorship made us decide to focus solely on authorship in our concept.

Image 12 Setting of the concept test

3.3.2 GUI USABILITY TEST

The tangible element of our concept (speaker with lights) was only informative. A graphical user interface (GUI) was designed to control the music (Image 13). With this interface, users could:

- Make a profile and optionally connect it to Spotify. This would make suggestions more tailored.
- They could search for songs and see suggestions.
- All the added songs that are played and will be played are visible in a queue. Showing the history gives users leverage when discussing who could play.
- They could manipulate the queue by adding songs, deleting songs or rearranging songs. When they would add a song, it was indicated that they added it by showing their profile identification.

To test the usability of the detachable interface, another test was set up. With InVision an interactive prototype was built and eight participants were asked to perform different tasks. To prevent learning effects, the order of the tasks was randomized. From this test, we found a major difficulty in our design. It was unclear for participants where the "home" button would lead them to. Also, none of the participants were able to find the "history of played songs" because they expected to find this after pressing "home". With this in mind, we iterated on the GUI (Image 14). A more elaborate description can be found in section 3.6 Concept summary.

Image 13 First Graphical User Interface

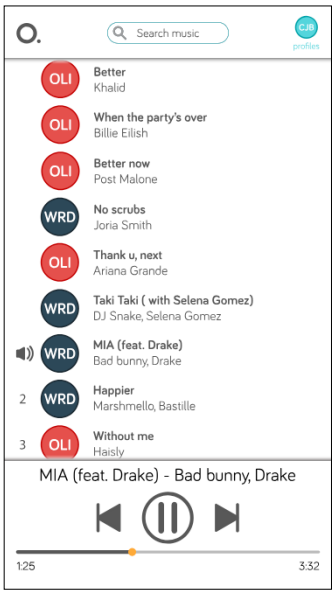


Image 14 Second Graphical User Interface

3.4 PROTOTYPE INTRODUCTION

Based on the findings from the concept test, we decided to focus on authorship. Our concept consisted of a speaker with lights that indicate authorship, that would be controlled with a GUI. To see how people may use it in real life and to check if our assumptions so far had been correct, we built a prototype.

This final prototype aims to see how showing authorship of the songs in a real social setting influences the user experience while listening to music in a group. It consists of a tangible interface and a digital interface. The tangible one is designed to show authorship of the songs with different colors and to produce sound via the speaker. The digital one is detachable and has a screen on it, to add songs to the queue with different profiles assigned.

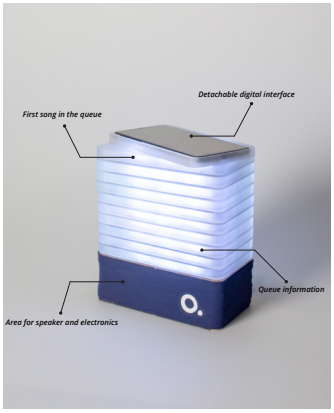


Image 14 Tangible prototype

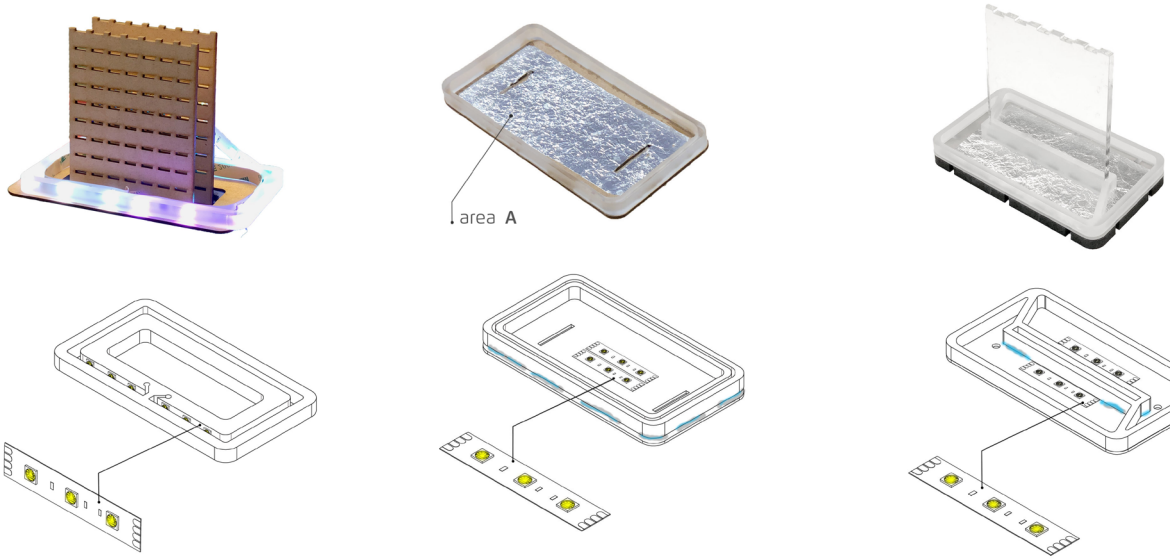
3.4.1 TANGIBLE INTERFACE

The tangible prototype consisted of ten acrylic light diffusers with RGB light strips installed inside, a built-in Bluetooth speaker, and an ESP32 controlled micro-controller. For a more detailed electronics-scheme, see Appendix A. The built-in Bluetooth speaker is connected to the digital interface such that songs can be selected on the digital interface and played via the speaker. With access to the Internet, the MCU board can constantly read the queue data from the web server and then reveal the colors of the queue via the light strips. (Image 14).

3.4.2 DIGITAL INTERFACE

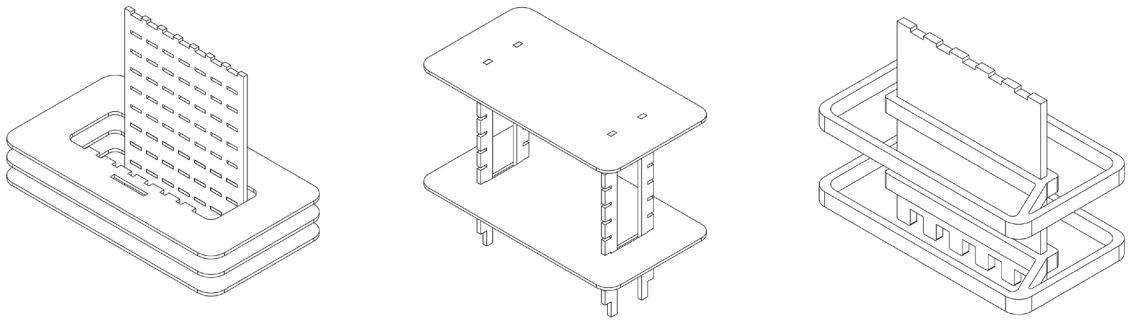
The digital designated screen interface was positioned on top of the tangible interface. The functionalities of this interface are 1) adding and selecting profiles (authorship), 2) adding songs to a song queue and 3)(re)positioning (those added) songs in the desired order. The latter two functionalities were repeatedly checked and updated to the server from which the tangible interface read. In this way, all actions of the actor were displayed and could be perceived and considered by the rest of the people involved. It was prototyped in a web browser to easily connect over the Internet with the tangible interface using a database (most used languages are Javascript, PHP, SQL). A limitation in the system was the database of songs, which was now consisting out of song requests used for the field deployments.

Since this prototype was built for a field deployment described in section 3.5, it has never been redesigned. Next iterations would be mostly focusing on the smoothness, integrating a validated aesthetic GUI and the database of songs, including its concerning legal rights.



Method 1 Method 2 Method 3

Image 15 Three methods of diffusing light



Method 1 Method 2 Method 3

Image 16 Three methods of connecting the diffusers

To improve the aesthetics of the prototype,

- three different methods of diffusing light were explored (Image 15)
- placing aluminum foil (area A) underneath the LED strips to diffuse the light evenly (see method 2 and method 3)
- three methods of transparent joints for connecting each diffuser were applied (Image 16). These methods allowed lights emitted from the LED strip to travel towards the diffusers and avoid creating shadows. However, the second method required glue to connect parts, which would leave the gluing marks on the acrylics and therefore the third method was introduced. (Image 17, 18)

Image 17 First tangible prototype

Image 18 Second tangible prototype 2

3.5 FIELD DEPLOYMENT

To validate if users would use our concept as expected and to see how they could give unexpected meaning to it, we conducted a field deployment. Two groups of friends, consisting out of five and six people, were asked to use our prototype as their music player when they met each other. To make sure they could play music they knew, we asked each participant to request ten songs which we put in our database before conducting the test.

A short discussion was started as a sensitization, inspired by the Co-Constructing stories method (Ozcelik & Terken, 2012), to understand how each group usually interact with their music. Afterwards, the prototype was briefly explained. However, the participants were not told what the lights meant nor their relationship to the GUI. They could freely use our prototype for about half an hour but were not told how long they could use it, to minimize time pressure (Image 19 & 20).

After this session, participants were asked to fill in a questionnaire derived from AttrakDiff (Hassenzahl, 2015) and UEQ (Schrepp, Hinderks, & Thomaschewski, 2014). The questionnaire was conducted as a personal reflective moment for the participants to fuel the following discussion on their experiences. In addition to their experiences, they were asked about interesting events that occurred during the session.

The data was analyzed through clustering of the statements of the participants and the field notes of the researchers (Image 21).

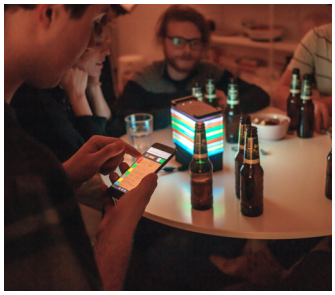


Image 19 Setting of field deployment

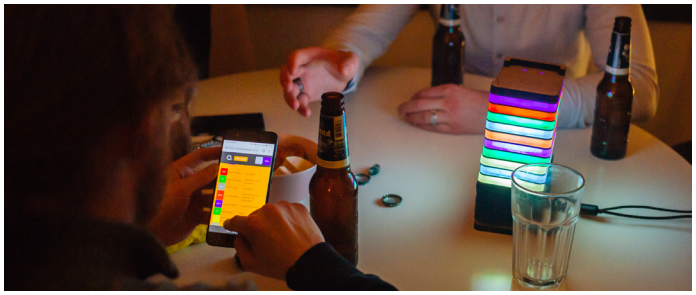


Image 20 Setting of field deployment

Image 21 Observing and taking notes

The most predominant finding was that the participants regulated their music fairly.

"If I saw, blue, green, blue, grey, green. I thought: Hey, where's my purple? [...] For me it's an indicator, that it's my turn. To make it more equal." - *session 1, participant S.*

The mood of the consecutive songs was rather random, which displeased some participants.

"[...] I like it when I can match the vibe, or completely switch. But now we were just listening to hard music, and then some reggae." - *session 1, participant M.*

Besides, we saw the participants collaborate while using the tangible light interface. Participants would point to the tangible queue and say:

"put your song here" - *session 2, participant J.*

In the second session, participants would hand around the GUI, encouraging everyone to add a song. Having one designated interface seemed to increase the fairness and the accessibility of the music as well as the overview.

"[...] It's better for the overview: okay M has the interface he is changing something." - *session 1, participant S.*

We also noted that the participants would correct each other if they saw that someone did not use their own profile. However, it was not very visible if an incorrect profile was being used, so only neighbors corrected each other.

3.6 CONCEPT SUMMARY

From our first concept test, we learned that authorship was the most favorable information type to retrieve and show. Next to that, it hinted that users strive for balance in who added how many songs. This was confirmed by our field deployment. Therefore in our final concept, we only display authorship.

Participants were eager to divide the songs equally and made sure everyone could play a song. However, this made the mood of consecutive songs somewhat random. This could be an effect of the setup since the participants had to send in song before the session and could not search for matching music freely during the session. As an improvement, perhaps behavior of the lights, like blinking, could reveal some information about the mood of the song (e.g., up-tempo or slow). However, for this iteration we only make the top light dynamic, to indicate that this is the current playing song.

Moreover, it was unclear for others which profile the person in control was using. Participants will correct each other, but it has to be more visible which profile is being used. This could be done by an indicator that would become visible whenever the screen is detached. This indicator could real-time show the color of the profile that is being used — allowing others to intervene when they see something not correct .

Users are only able to reorder songs in the queue they added themselves. Because of this, they can hold each other accountable for any changes. However, users could switch profiles to 'cheat'. Nevertheless, in combination with an indicator as explained above, they can hold each other accountable.

During the field deployment described in section 3.5, we noticed that it was unclear for users to understand which songs of the queue are visible on the tangible device. Therefore, we placed a rank (i.e. number) on the second iteration GUI next to each song and lowered the contrast for songs that were not displayed on the speaker (Image 22).

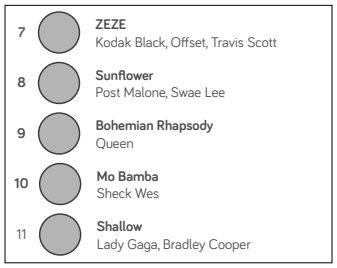


Image 22 Ranking on the queue

By using the public information that is available from Spotify, profiles can be made and connected without logging in. This reduces the hassle of creating profiles

If profiles are linked to Spotify accounts, a colored line appears under each recommended song which indicates who may like it (Image 23).

When a song has been added to the queue, this will be indicated through the button. This makes it easier to see if your song has been added (Image 24).

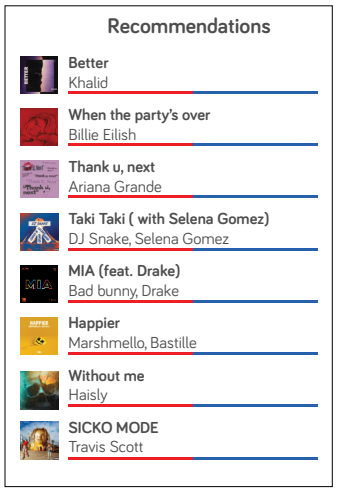


Image 23 Recommended songs

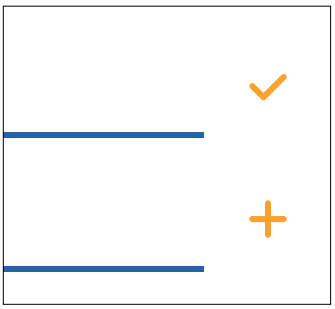


Image 24 Added icon

When the user is not in the "queue", the music control element is shrunk for a better overview (Image 25).

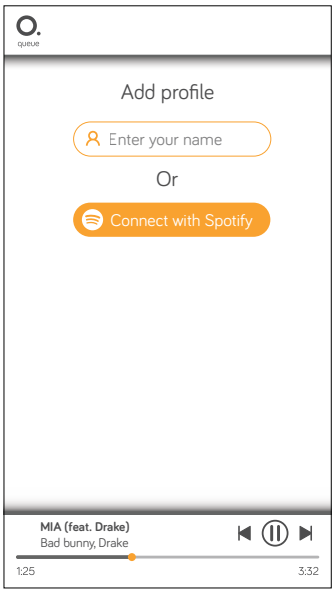


Image 25 Overview

4 FUTURE WORK

4.1 TESTING

After conducting several types of tests throughout the design process, there is still a lot of testing possibilities we have already foreseen. Firstly, we believe that longer field deployments are needed to resemble social events which can take two hours at least (we tested for roughly half an hour). On top of that also more than two deployments are needed in which also group size, background activity (e.g., relaxing, cooking, cleaning, etc.) and space are taken into consideration. It is recommended to investigate in those and maybe even more found different factors in social settings (where music is played).

4.2 OTHER CONCEPT FEATURES

After the concept test (see section 3.3.1) we learned that authorship was preferred over urgency or intention. However, we suggest to try and explore these two during a field deployment such we did with authorship. We still argue that authorship is most important, but urgency and intention might have some more perspective in different settings or when showed with less focus. Another concept feature we did not investigate was the number of songs showed on the tangible interface. For now we chose to show the upcoming ten songs in the queue, but there is never proven that this is the correct amount for the tested setting.

Another feature which could potentially strengthen our concept can be the grouping/linking of songs to moderate moods and vibes. This feature was considered but never integrated into the functional prototype and thus needs further exploration. They might allow users to indicate groups or 'vibes'. However, in the field study, participants deliberately distributed songs of the same author. This is a counter-argument for the implementation of this feature.

4.3 PRODUCT SETTINGS

While refining the final concept, we focused mainly on group sizes from three to ten, which preferably all known (e.g., a group of friends hanging out). Although this was the scope of the project, we think this product has to be functional also for a single user, probably the owner of the system, or possibly also for even larger groups (10+). From the field deployment, we learned that people all liked the ambiance the light provided (Image 26). Therefore we believe light might be an interesting feature to consider when designing for different settings. For individual use, as owner, other concept features are needed to be considered (see section 3.2), since authorship is redundant.

Image 26 Ambient lighting

During the final demonstration day, we found out that a significant amount of visitors were associating our prototype with karaoke. It is a context that we never considered, but the concept might be valid with minor changes.

5 ACKNOWLEDGMENTS

As a project group, we would like to thank our coaches H. van Essen and Y. Chuang for the valuable feedback moments and insights along our project. We would also like to thank everyone that participated in our user studies.

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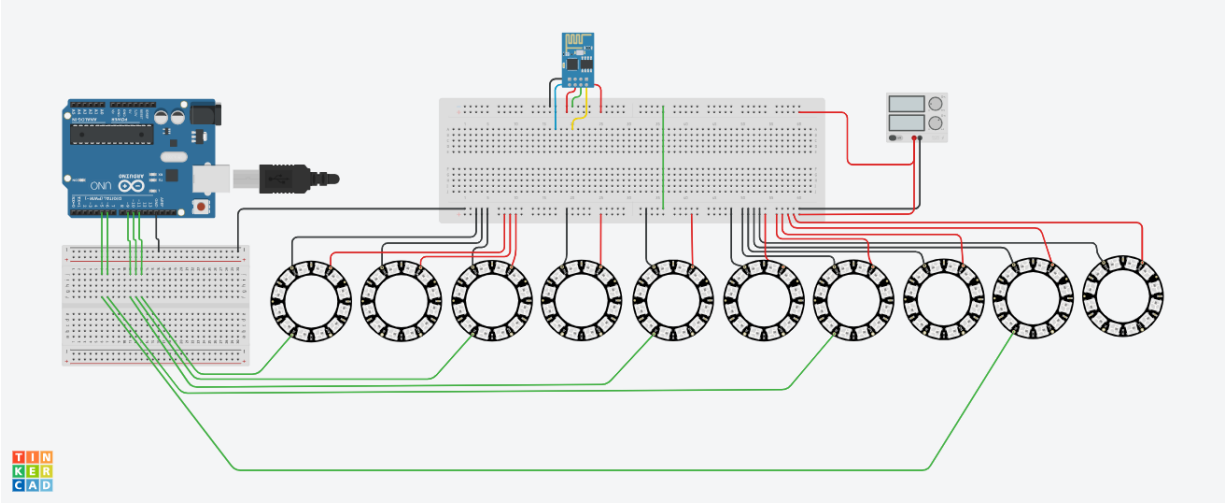
7 APPENDICES

A. ELECTRICAL CIRCUIT



M1.1

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