Experiencing Music Together: Control and Identity

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Abstract:

MEET is a music system allowing people to bring and share their music via streaming over global networks. The system consists of a player where a smartphone application allows access to music from a host located elsewhere. The system is designed to let people nominate and vote for the music in the player, ensuring that the music never stops. Interacting with the player is done from the users' own smartphones, creating a new shared multi-device control structure. The player is further connected to a situated display, displaying nominations and the currently playing song, giving an innovative user experience.
The paper describes the concept and development of MEET and furthermore presents three field tests conducted in three different locations. Findings from the tests showed that the system supports identity expression and impressions as well as social interaction. There were additionally unveiled some interesting general aspects of multi-device interaction during the tests. The system presents a new approach to music listening at private social events.

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Preface

This master thesis is written by three software engineering students at the Department of Computer Science at Aalborg University. The course of the project was commenced on the 1st of September 2010 and the thesis was handed in on the 7th of June 2011.
The thesis is developed in the research area of human-computer interaction focusing on topics concerning ubiquitous music systems. The paper concerns the development and field testing of a music system, enabling access to users' distributed home music libraries with their smartphones as an access point and play music from a common music library.

We have defined keywords which are used consistently throughout the paper to create clarity about the different system parts in MEET.

Home library The distributed user libraries connected to the player at the social event.

Player library The library in the player assembled from the connected home libraries. This library contains the music that can be nominated.

Shared library A list of songs selected from a user's home library to be shared.

Desktop application The library part and the player part are contained in one application called the desktop application.

Nominations The songs chosen by the users that can be voted for and potentially be played.

Two types of source references are used throughout the paper. If a reference is placed after a period, it refers to the given section and if the reference is placed before a period, it refers to the particular sentence or word. Sources to the references used throughout this paper can be found at the end of the paper.

We would like to use this opportunity to thank our supervisor Jesper Kjeldskov for his help and support. Thanks to all the test persons who made the field tests possible, and a special thanks to Mikael Skov and Jeni Paay for helping us in the design phase of the system development.

Aalborg, June 2011
- Henrik Sørensen
- Simon Lind Damgaard
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1 Introduction

For a lot of people, music is an important part of the everyday life. One thing is however listening to music alone, where there is only one to decide what to hear, another is listening to music together. At certain private social events, people would like to have an influence on the music played and this is not exclusively because they like some music more than other. Music is also a part of people's identity and is a way for them to express something about themselves, as well as get an impression of others.

Technology, such as digitalization of music, powerful mobile devices and constant Internet connection, opens up for new ways to access and experience music together. Music becomes ubiquitous and is not necessarily something you have to bring along, not even digitalized on a portable MP3 player. Public music services which give access to versatile music libraries, get more and more common and are also used in private social settings. The increased use of such systems have introduced some new tendencies around music management, changing the control and interaction around the choice of music at social events.

To explore new technologically supported possibilities of sharing, controlling and listening to music, the system MEET has been developed. MEET builds on a technical framework developed during the first semester of the master's program and is a music system based on ubiquitous music libraries used in a social context. It is a multi-device system which enables multiple points of control. The system consists of five modules; a library, a player and a mobile device, a situated display and a tablet which together constitute a music system contributing to a new and innovative approach to music-experience in a social context. Every user can have a music library at home accessible via their mobile phone's Internet connection. From their mobile phone, they can share music from their home library to the player at the party they are attending, to where the music is streamed directly. The system is focused around a situated display showing the users which song is playing and which music can be played next. From the mobile phone, the users can connect to the player and browse the player library consisting of music shared by other connected users. The mobile phone furthermore works as a control device, which enables the user to add nominations, shown on the situated display, and vote for these.

The focus of the study is defined by the following research questions:

> *How can tehcnological solutions support interaction design for distributed musical influence in a social context?*
>
> *How can music systems support social interaction and identity expression and impression?*

Based on the research questions and to get an understanding of how MEET would work in-situ at different social events, we conducted three field tests. The choice of three different test locations was to test the system by versatile audiences in different physical settings. The tests were based on people using the MEET mobile application from their own mobile phones, and having the option of using their own laptop to contribute with their personal music.

2
Related Work

Studies have shown that it is common behavior to share music. It is natural to present others to your favorite music and afterwards give them a copy or transfer it to their computer. Furthermore, people make use of the Internet where they can pick out their favorite music by downloading compilations of singles instead of buying entire albums. Sharing and copying music is motivated by different factors such as inspiration and exploration. Additionally people find pride in having a physical music collection and mainly tend to use downloads as inspiration while afterwards buying the music. [1] Another important factor is that people obtain a degree of mutual understanding, when having a similar music taste; they can share emotions, intentions and meanings without using their language [2].
One of the main areas in our study concerns having the option to bring and share your own music at a social event such as a party. Meanwhile, it is of great importance to accentuate the people who have brought music, to support the communication and social interaction building on mutual understanding and feelings which might arise when having the same taste in music.

A common way of sharing music is by means of Internet based file sharing systems or music streaming services, which give access to a great amount of diverse music. Several studies on the differences between large music services and personal music collections have been made as a result of the increasing amount of public music services. [3] Public music services consisting of a common music library often lack the important aspect of having a musical identity through a personal music collection.
Push!Music is a portable music system trying to enable music exploration on the move. The system automatically creates recommendations for nearby users who have a common music taste. Users may also manually recommend music wirelessly to friends. The study based on this system has shown that people prefer the direct music exchange, from and to people they know, instead of the anonymous automatic recommendations which can be pushed to ones music device [4].
A property of MEET is emphasis on personality to avoid becoming yet another music system giving access to a common music library containing anonymous music. To support the communication around music, all songs in the system should have an owner, making it possible to show who have brought a specific song. The study focuses on how people accept the attempt of expressing identity through profile names and pictures displayed on a situated display.

Another group of studies revolve around the subject of how music formulates and expresses ones personal identity. A music collection says a lot about a person, and communication around music has a great impact on the social bonds people create. [1] [5] [2] Social studies have shown that music brings people together and serves as a joint focus of activities [6]. It is furthermore found that people quickly form an impression about other persons, from a quick glance at their playlists [5]. It is important to people, through their music, to appear as they would like to be seen. In a study based on the use of iTunes, users have expressed how they were conscious about which music they had in their playlist since it was visible to others. One person commented that he sometimes purchased music online for his wife, but did not want to store this music in his playlist, since it might give a wrong impression of him to his colleagues [5]. These findings indicate how important a role communication, impression and expression may have to social interactions in connection with music.
MEET introduces a new kind of ubiquitous and self-controlled music sharing. The users have exclusive rights to decide which subset of their music library they want to share at a given party. The study focuses on giving the users a scope of self-determination in music sharing to make their appearance correspond to their current social context.

Other studies focus on another kind of identity expression, concerning how people make use of naming in different systems. A study on names in Instant Messaging (IM) [7] has shown that IM profile names are used as a source for identification, broadcasting messages and sending out information about a people. Similarly, a study on bluetooth naming [8], has shown that the name of people's bluetooth device is largely expressive of a personal or group identity. Most people choose names which are easily recognizable and identifiable by their immediate social group. In the study, most names were the phone's owner's name, initials or nicknames, while others chose an "ask me" name as, e.g., an email address or profession. Some people occasionally browsed bluetooth names to see who was in the near surroundings and sometimes used them to get in contact with strangers. The study based on iTunes [5] has also shown that people are conscious about the name they choose as their public name. In iTunes one can change the name of the music collection and there were different approaches to how the names were chosen. Some chose their name according to their music library and other names referred to people's hobbies. One changed the name to a more appropriate one after the manager joined into the music sharing.
MEET lets people choose a profile name and a profile picture which, during the use of the system, is displayed to the other users. During the tests we observe how people choose their profile names and pictures to find out if and how the system supports identity expression by the users.

Attempts of creating alternative music systems have been made to overcome the fact that music systems become impersonal and intangible. The "Music Book" tries to combine the digital music libraries with a tangible cover representation, to support identity expression through a tangible music collection [9]. The music is bought and downloaded, and a physical cover is mailed to the users afterwards. The cover contains an RF tag, acting as a unique identifier, that

is read from a music player which plays the music. This system combines the advantages of storing music digitally and still getting the feeling of ownership connected to a physical music collection.
The "Music Buddy" lets you browse through other people's music collection via the Internet, solely as a source of inspiration to discover and explore new music and not for downloading [9]. The system tries to combine the advantages of physical music sharing and Internet music sharing to obtain the flexibility around digital music and the socialization around physical music sharing. Music Buddy lets users chat with others with similar music taste, exchanging information about upcoming or unknown bands they did not know about. Other studies, such as tunA [10] and BluetunA [11], also focus on the social aspect of browsing other people's music collections with the purpose of discovering new music.
The study based on MEET does not focus on music discovery, but due to the nature of the system, regarding a music library assembled of many peoples sub-libraries, this is an interesting area to be aware of during the study.

Another area interesting for the development of MEET is different ways of controlling music at private social events. A study based on a system called Jukola presents an alternative approach of controlling music in a social context in a public space [12]. The system allows people to vote for music via a handheld client, and was tested in a caf where each table had access to such a control device. The control activity was primarily executed in groups around the tables which resulted in social exchanges and conversations. The music in the system was provided by the bar staff and the visitors could browse and nominate from a shared central touchscreen. People were excited to have influence on the music and there was a strong feeling of both identity expression and impression mainly based on the voting game.
MEET has a focus similar to that of Jukola's, however, people are allowed to bring their own music and are able to nominate and vote from their personal device. The study regarding MEET focuses on people's reaction to sharing their own music from home and the fact that they can interact with the system just by using their private smartphone. The voting game has some similarities to that of Jukola's, but show different tendencies when people use their own phones and have the possibility of voting privately.

During the first semester of the master's program a technological analysis was made, founded on different popular music systems representative of interesting topics in music sharing. The analysis had the purpose of comparing the systems on specific parameters, unveiling unexplored topics in these areas and to locate both advantages and limitations of existing music services. The system functionalities compared were functionalities dealing with sharing and listening to music. Firstly, we looked at the systems' functionalities supporting streaming and if the streaming was local or global. Secondly, we looked at how and if the systems' made use of synchronization when transferring or sharing music and lastly, which functionalities the systems' offered regarding use in social contexts. The analyzed technologies were iTunes [13], Grooveshark [14], OrbLive [15] and Digital Living Network Alliance (DLNA) [16]. All four had functionalities to share music, but with quite different approaches.
iTunes and DLNA enable music sharing over local networks. The music is not

transferred but is accessible on the same network via streaming. In iTunes a maximum of five computers can access the same music library. DLNA lets multiple devices access each other as long as the devices are DLNA certified. With DLNA you can, e.g., listen to music from your mobile phone on your TV. Both systems enable media sharing but are limited by the local network range. OrbLive is a system that lets you access your media at home via your smartphone. When your computer is set up as a server, the media can be streamed directly to the mobile device wherever you are. OrbLive is aimed at single users which means that only one person can access a media library at the same time. Letting others access your library results in you having no access. Grooveshark is an online music service that lets users upload music, giving all other users access to their music. Grooveshark is basically a music library that can be accessed everywhere as long as an Internet connection is available.
The results of the analysis, combined with inspiration from related work, created a strong foundation for the development of MEET. First of all, we want users to have access to their music at private social events, with no limitations of, e.g., local networks. The users should be able to access their music using their mobile phone which has become a natural part of people's pocket inventory. Furthermore, the user should have supreme rights of what to share at what time. We wanted to create a music system with the primary goal of sharing music at social events, while supporting identity expression and impression through social interaction and music control.

3 Methodology

The following chapter goes through the different parts of the development process and the test method. We describe the workshop in which we developed concepts for the system interface through methods such as sketching, paper prototyping and mock-ups. Next, the development method used in the design and implementation phase is described, and lastly, we go through which data collection methods are used in the tests and how the gathered data is analyzed.

3.1 Development Method

In the first semester of the master's program, a technical framework was developed, but the exact user experience concept extension, was not yet specified. The method used for this development, which includes a design workshop and the following incremental development, is described in this section.

3.1.1 Workshop

In order to begin the design process, a workshop was arranged with the goal of creating a conceptual design that would form the foundation of the study. More specifically the implementation of a functional prototype used in the planned field tests would be developed. Three HCI researchers from our department, including the current supervisor, agreed to join the workshop. In the beginning

of the workshop, some general design goals and guidelines were established, to focus the idea generation. Contributions were written on a blackboard and, as it was a relatively small group, it was managed as a group discussion. The

next phase was an iterative sketching session where each attendee would individually generate and sketch an idea over a number of rounds. The workshop was primarily focused on the mobile application and situated display, as they are the primary points of interaction. Between rounds, each participant took turn presenting their idea briefly and a following group discussion led to further refinement. A new round would thereby be based on a new collective knowledge foundation where each individual could have been inspired by others. The time slot for each round would vary and depended on time needed in each individual round. In practice they ended up lasting for 5-10 minutes. During this phase one person was assigned the role of facilitator and was thereby delegated the responsibility of managing rounds and facilitating the discussions. One of

the attending researchers was not familiar with the previous work and read up on the material, while being present in the same room. She would join in on the intermediate discussions, as well as observe and form questions for further design. There was no predefined number of rounds, but after three rounds, a natural point was reached, where the group agreed on a conceptual design idea. The last phase was carried out without the guest researchers and was a proto-

typing exercise where paper prototyping and sketching were utilized, to create an initial prototype of the agreed upon design concept. The paper prototyping did not end at the workshop but continued into the implementation, where detailed mock-ups were created incrementally. These could effortlessly be altered to preview design changes on-the-fly and be used as models for the actual design implementations. An example of a sketch, paper prototype and mock-up of the mobile voting screen developed during this process, is shown in figure 3.1, 3.2 and 3.3, respectively.

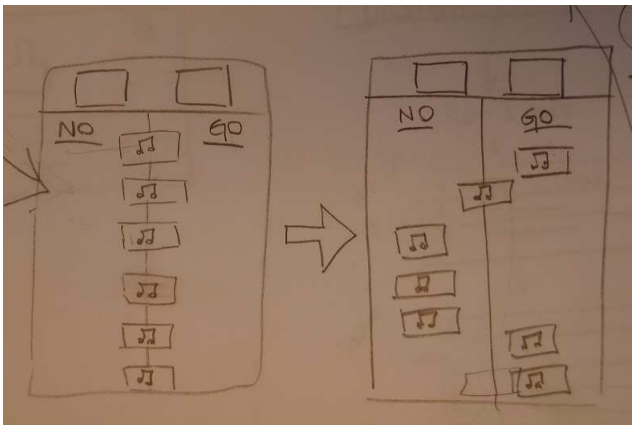
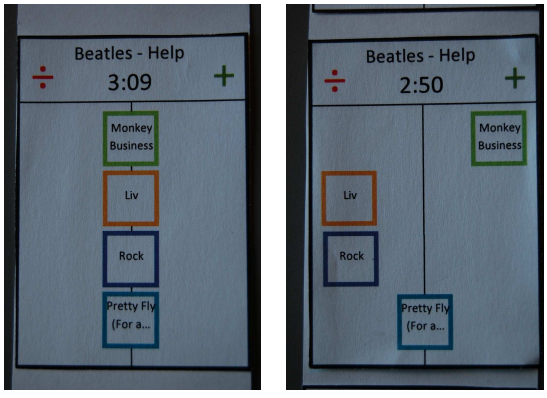


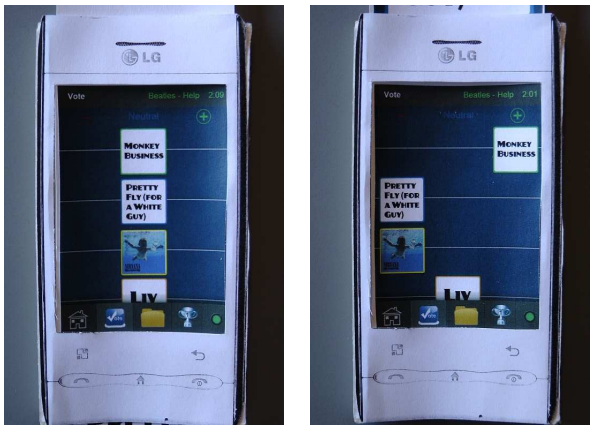
Figure 3.1: Sketch of mobile voting screen made during the workshop.



(a) Music items with a neutral vote.

(b) Music items voted for and against.

Figure 3.2: Paper prototypes of the mobile voting screen.

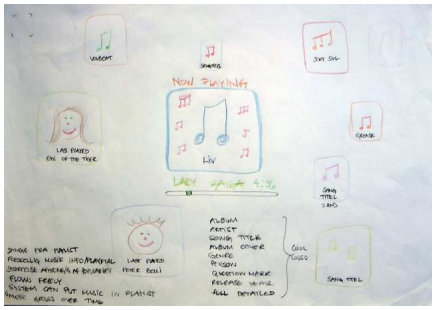


(a) Music items with a neutral vote.

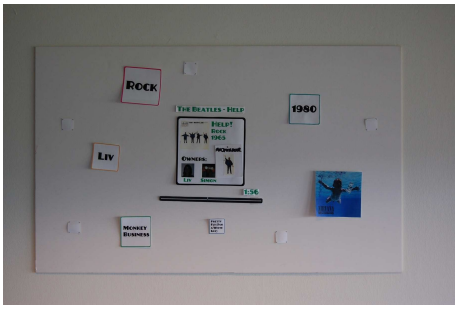
(b) Music items voted for and against.

Figure 3.3: Mock-ups of the mobile voting screen.

Figure 3.4(a) and 3.4(b) show a sketch and a mock-up of the situated display also dveloped during the workshop.



(a) Workshop sketch



(b) Workshop mock-up

Figure 3.4: The conceptual workshop sketch and the detailed mock-up.

3.1.2 Incremental Development

Because of the nature of the system, the development was inherently separated into five modules:

- Library
- Player
- Situated display
- Mobile application
- Tablet application

Figure 3.1.2 shows the incremental iterative development cycle. The iterations

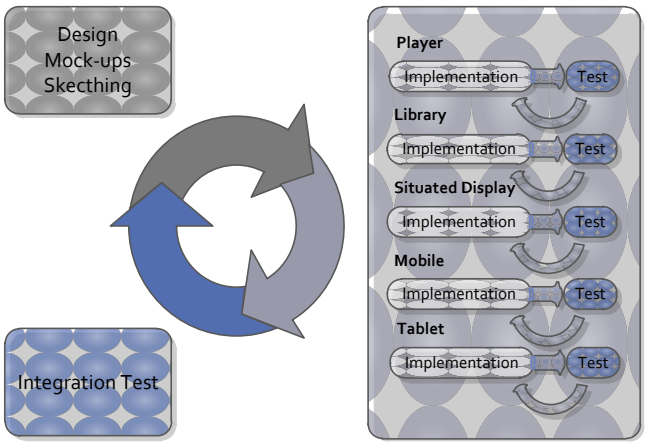


Figure 3.5: Development cycle.

were not very strict, but instead, especially in the initial phase, based on the goal of implementing the newest mock-up. Later they were based on design changes or implementation of specific features across the different modules. Iteration goals would be broken into smaller tasks that were maintained in a SCRUM-like sprint backlog [17] placed in a common wiki [18].

There were dependencies between the different modules, but they could still be developed in parallel. When features were ready in one module, they would be tested separately. When the entire set of features was implemented, it would be integration tested in-use and if successful, a new iteration could be started. All tests were informal tests, performed with the goal of ensuring functionality and reliability of features during future field tests.
A rough estimate of the extent of the development process is 1200 man-hours where 350 were used on the technical framework, created in the previous semester, and 850 used on this study. The final product consists of approximately 5500 lines of mobile application source code and 9200 lines of desktop application source code.

3.2 Data Collection

Testing a new and untried concept we wanted to have an open angle of approach to what topics could arise during the tests, since we had no pre-formed theory in form of hypotheses. During the tests we collected a set of empirical data gathered from different sources which we afterwards analyzed, trying to clarify some interesting concepts in the area of multi-device music systems supporting musical identities in a social context. The test results were collected from camera recordings, pictures, observations, log data and semi-structured interviews. Depending on location and attendees not all data gathering techniques were possible or acceptable.
During the tests, we assumed different roles to ensure that every area of responsibility was always covered. The three roles defined were:

- Observer: Had primary responsibility of capturing important events and taking notes.
- Interviewer: Responsible for conducting interviews.
- Technical supporter: Helped test participants with any technical inquiries, such as installing and setting up the mobile application.

The roles were dynamic meaning that they could change between us in case something unexpected would come up. If no interviews were conducted or if no technical support was needed, the observer role would be assumed instead. Having a camera record continuously during the tests ensured that if, e.g., the observer role was missing for a moment, the camera would capture most of the interaction space around the situated display, reducing the numbers of inattentive minutes as much as possible.

Observations: During the tests, observations were documented through handwritten notes to ensure that no important findings were forgotten. The notes would consist of a timestamp and a description of the event. Participants would occasionally approach us with individual comments, such as feature requests or spontaneous reactions to the system, which were also noted.

Interviews: During the tests we carried out semi-structured interviews to utilize the potential of exploring interesting areas in depth. Since this was the first time the system was tested, the interaction and use of the system was relatively unknown. It was hence important that we pursued and dug into topics which we might have overlooked in the preparation of the interviews, and clarified potential obscurities of the replies. For the interviews we prepared a set of questions which ensured that the areas, interesting for the tests, were covered. The questions were generated with focus on being open-ended to get the most out of the users and find unexpected use patterns. The questions are listed in appendix B. A portable camera was used to record the interviews when allowed and transcriptions are shown in appendix C.

Stationary Video Recordings and Pictures: A second camera was set up to observe people's reactions to the situated display, and furthermore, to record the use of the tablet. The camera recordings made it possible to review activity after the tests were carried out, acting as a backup in case something was missed in the observations or a higher level of detail was required. The test locations only made it possible to use the stationary camera in test 1 and test 2, where it was possible to direct the camera without pointing directly at the attendees. This was due to privacy issues of the participants. The camera used for interviews was also used to take still pictures during test 2 and test 3 to capture the use of the mobile devices, which the stationary camera was not directed at. The people at test 1 did not wish to have their picture taken nor to be recorded.

Automated Data Collection: As with most HCI studies where a software system is evaluated, the system itself is an obvious data resource, due to the relatively low effort needed to obtain useful data. In our case a custom log module was integrated into the player, enabling it to perform a level of activity logging about user interaction, that would be difficult to obtain otherwise. After the tests, this data could help uncover interesting patterns and frequency of the use of the system and help substantiate findings made through other data sources. The data granularity was chosen to be quite coarse-grained, obtaining a broad understanding of the interaction, in order to take unexpected findings into account. With the research questions in mind, it was more useful to look at user interactions with the player, rather than, e.g., keystroke logging on the mobile devices. The data logged is as follows:

- Connections made by mobile devices
- Initial username and subsequent changes
- Users' private library
- Users' shared songs and subsequent changes
- Votes
- Nominations
- A snapshot of songs currently nominated at the end of each song. This includes current rating, representation mode, owner, nominator and number of songs played while the song has been nominated.

The format would primarily follow the structure: When, who, what? This instrumentation was saved in a comma-separated-value format which enabled it to be directly analyzed in a spreadsheet tool like, e.g., Microsoft Excel. Through formulas, data analysis could be performed relatively effortlessly and support visualization of log data.

3.3 Data Analysis

After all three tests were carried out, different sets of data needed to be analyzed. Because of the diversity of the data types the analysis of these needed different approaches. The overall approach was to make use of the research method Content Analysis which builds on a systematic and objective analysis of test data to clarify important topics and generate new knowledge. Audience content builds on feedback from the participants, more specifically interviews and observations.

Observations: As one data collection method, we chose to make use of observations with no expectations of what could happen. The notes taken during the tests therefore gave a broad insight into interaction with the system and activities around it. Subsequent discussions were performed to formalize results and categorize them into general topics. The results both included expected findings which were further probed during interviews, as well as unexpected ones. To avoid misinterpretations and bias injection the topics found were supported by the log data collected via the player, the interviews made during the tests and the video recordings and pictures.

Interviews: Interview data was in the form of notes and video recordings. Analyzing this data we went through the notes which were based on questions prepared before the tests, and the video recordings were transcribed. The interview notes were mainly used to underpin the observations made during the tests. The resulting topics were further supported by direct quotes taken from the transcriptions. The interview notes worked furthermore as references, when working with the interesting areas.

Stationary Video Recordings and Pictures: The video recordings from the stationary camera and the pictures were reviewed to identify activities not uncovered by other resources. They were furthermore used as backup material if we had uncertainties about some observations or statements from the interviews. We did not make exhaustive transcription of these videos.

Automated Data Collection: Data logs were never intended to be the primary research data source. Because the tests were not controlled experiments, it was difficult to deduce anything without context and even then it would require extensive data mining to do substantiated findings. Simple counts of events and visualization of data was however initially conducted in an attempt to discover use patterns or tendencies that were not detected elsewhere. Afterwards they were mainly used to support observations and interview statements. In addition, logs were analyzed to obtain statistical data about the number of connections, shared songs, votes, nomination etc.

4
MEET - the System

This chapter goes through all relevant areas regarding the system implementation. Firstly, the overall system architecture design and how the different modules interact is described and secondly, usage of the system is described. Finally, central implementation areas and interface designs are described.

4.1 Architecture

The overall idea of the MEET system is to be able to access a home music library from a mobile phone and, through the phone, share a selection of music in the home library. This selection constitutes the shared library which only exists on the mobile phone. The list of music in the shared library is what will be shared to a player and will become part of the player library which is common to all connected mobile phones. The music from the player library is then streamed directly from the corresponding home library to the player on demand.
In the beginning of the design process a set of conceptual design goals were defined that lay out guidelines for the system:

- The music never stops: Songs are never interrupted and there is always a song ready to be played next.
- The system is secondary: MEET is not supposed to be the center of attention. It is not a multi-user entertainment system but rather a music system playing in the background.
- Different levels of participation: It should be possible to obtain musical influence on the music on different levels. A higher level of participation should be rewarded, but in order to make the system secondary, it should also be possible to use the system with less effort.
- Identity expression and impression: Users should be able to express their musical identity, through the system, as well as obtain impressions of other users' musical identity.

The system architecture consists of five system parts, all interconnected to create the MEET system. As seen in figure 4.1 the five parts are player, library, mobile, situated display and tablet, where each user can have an instance of a mobile and/or library application.

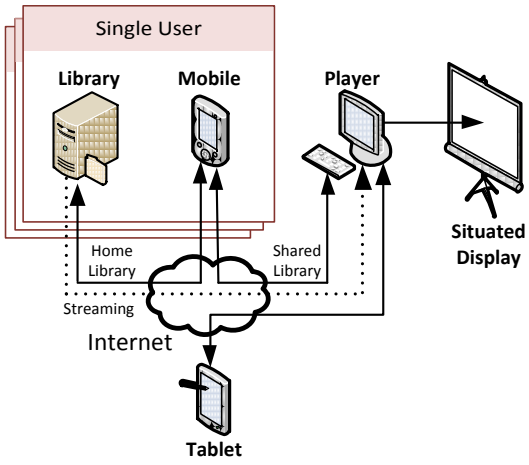


Figure 4.1: The MEET system architecture.

A user of the MEET system must have the mobile application installed in order to interact with the music player, but is not required to have the library application installed. The mobile phone is considered a key token and a central part of the system since it allows users to access their home music library and share their music to the connected player. The mobile further works as a control device giving the users functionalities of nominating and voting for music. The mobile sends and receives music lists across the Internet.
When a user has selected music to share, the player has access to exactly this subset of music from the user's home library. The music is streamed from the user's home library to the player and when the user disconnects or unshares the music, the player is no longer able to request music from this library.
The player can maintain connections with multiple mobile, and has a temporary music library consisting of all the music shared from the mobile phones. Depending on the owner of the songs to be played, the music is streamed from different remote libraries. The mobile application features browsing through the player library and can nominate music to a list of nominations which is visualized on the situated display.
A modified version of the mobile application is installed on the tablet and only features the functionalities of nominating from the player library and voting on the nominations.
The situated display is the only part of the system not communicating across the Internet, but is physically connected to the player as an extended display.

4.1.1 Architectural Changes

The overall architecture has been modified from the first prototype developed during the first semester of the master's program. In the first prototype the system consisted of a library, a player, the mobile and a facilitator being a webserver managing the mobile connections. The facilitator consisted of a database holding all relevant connection information to be used between mobile, library and

player. Having this intermediate module, which handled the vital connection functionality, created an extra dependency in the system. Starting the second semester of the master thesis we modified the system architecture by letting the mobile application hand out the connection information to the player, which afterwards created a connection to the library. This architecture simplifies the implementation and removes a potential point of failure from the system.

4.2 Usage

As described in section 4.1 the system consists of five parts communicating in different ways. This section goes through the different setups and usages of the modules, both individually and collaboratively. The usage is divided into suitable areas and are backed up with user scenarios.

Configuration: The MEET desktop application contains both the library and the player and can be installed on a computer running Windows, Linux or Mac OS. The library needs to be configured by the user, selecting what music to add to the MEET library. The player, however, needs no setup after installation. After the desktop application is installed, the user needs to install the mobile application to connect to these.
After installing the mobile application on a smartphone, the user can create a user profile by writing a profile name and taking a profile picture. This profile is later used when connected to a player, where both profile name and picture are shown in relation to activities from the connected users. Figure 4.2 shows a picture of a person helping a user taking a profile picture for a MEET profile, before using the system.

Figure 4.2: A person taking a picture for the MEET user profile.

Connection: After setting up the library with the desired music, the user must scan a library barcode using the MEET mobile application. The barcode contains all relevant information to create a connection between the mobile and the library. The same barcode functionality is used to connect to the player, which is shown in figure 4.3.

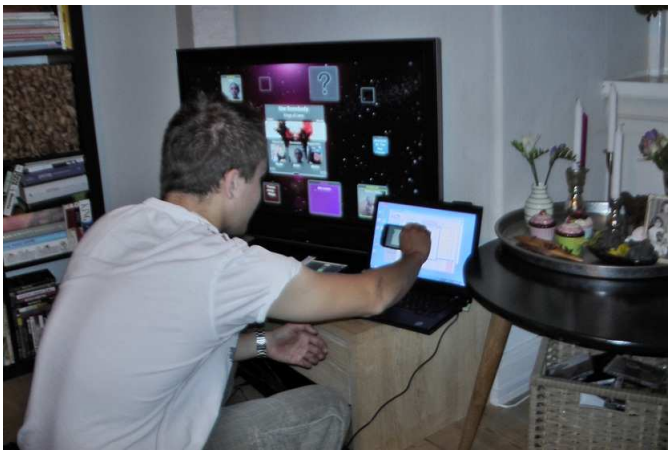


Figure 4.3: A user scans a barcode to connect to the music player.

In the first prototype of the technical framework, users had to manually input connection information in the mobile application, such as IP address and port. The reason for choosing to enclose all this information in a barcode and hide it from the user, is to simplify the connection process.

Sharing: After connecting the mobile to the library, the user can browse through the connected home library and add music to a shared library which is automatically shared when connecting to a player. When the mobile is connected to a player, the shared library can be changed at any time by adding or removing music, simultaneously updating the player library.

Nomination: Each mobile connected to a player can browse through and nominate songs in the player library, consisting of each user's selection of songs from their music library. The difference between a conventional playlist and the nomination list, is that a playlist clearly shows the sequential order in which the songs will be played. The nomination list contains potential songs to be played in an ever changing order depending on user nominations and votes.
The nomination list has a maximum size of 10 nominations, all of which are represented on the situated display. If the list is smaller than 10 items, the empty slots are represented as well. When a user nominates a song from the player library, the song is plotted into an empty slot. When all ten slots are occupied no more nominations can be made. Each time a new song is played, at least one slot will empty and be ready for a new nomination.

The choice of having 10 nomination slots in the nomination list comes from an estimate of how changeable the music should be. We wanted to limit the size of the nomination list to create a clear overview to the user, while displaying all the information on the situated display at all times. The limit should however be large enough to give multiple users a chance to nominate songs. All the mobiles connected to the player have a maximum limit of how many nominations can be made from this device. This ensures that one person can not nominate 10 of his favorite songs, hence monopolizing the nomination list.
If no user nominations are made, the system automatically maintains a threshold of a minimum of four nominations, by randomly nominating songs. This feature is made to accommodate the design goal of *The music never stops*.

Voting: Each mobile connected to a player can vote for the nominated songs. The mobile displays a list of all the nominated songs and the user can vote for or against each song or leave it in the neutral position. The votes can at any time be changed as long as the song is still nominated. Figure 4.4 captures a user voting on the nominated music via his smartphone.
To avoid stagnation in the nomination list, two elimination rules are made. Firstly, if the total vote count is negative and secondly, if the nomination has received no votes after three songs in a row have ended, the nomination is eliminated from the list.

Figure 4.4: A user interacts with the voting screen on his smartphone.

For users who do not have a smartphone, nominating and voting can be done via a shared tablet. Figure 4.5 captures a user interacting with the tablet in front of the situated display.

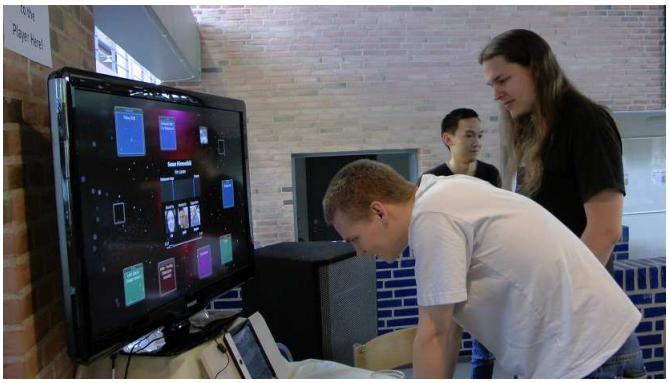


Figure 4.5: A user interacts with the tablet to nominate and vote.

Situated Display: All the nominated songs are shown on a situated display that displays the 10 nomination slots. The nominations on the situated display grow and shrink according to the votes received from the mobile phones and the tablet. The 10 slots placed around the center of the screen take different representation modes when a song is nominated. The different representation modes decide how much information people should be given about a nomination. A song can be represented by genre, artist, title, cover art, album, picture of owner or nominator, a questionmark and the information needed to accurately identify a song; both artist and song title. The questionmark is a wildcard where no information about the song is shown. Figure 4.6 shows the situated display with different sizes and representation modes of nominated songs. Furthermore, the song currently playing is placed in the center of the situated display with all available information shown.

Figure 4.6: Screenshot of situated display.

4.2.1 User Scenario

Henrik and Liv have been invited to a party at Simon's. Simon uses a new music system called MEET, where all his guests can bring their own music to his party, and therefore asks his guests to install the programs needed to use MEET.

***Configuration and Connection*:** Henrik has a stationary computer at home with a lot of music, while Liv only has a few singles on her laptop. They both install the MEET desktop application on their computers to be able to stream their music to Simon's music player at the party. Liv adds all her MP3 files to the home library since she wants to bring all of her music. Henrik goes through his MP3 files and selects the music he believes people at the party would like to hear, and ends up sharing 10 albums.
Before going to the party, both Henrik and Liv install the MEET mobile application on their smartphones. To be able to access the music that they have added to their home libraries, they use the mobile application to scan a library barcode generated from their MEET desktop application. Using their mobile phones they can now access and browse through the music from their home library.
Henrik, Simon and Liv furthermore create a user profile in the MEET mobile application. They each choose a profile name and take a profile picture of themselves. When they later connect to the player the user information will be shared.

***Sharing*:** Henrik and Liv arrive at Simon's party. Beforehand, Henrik has via his smartphone selected seven out of 10 albums, from his home library, which he wants to share at Simon's party, since three of the albums were maybe a little ill-timed at that party. When Henrik arrives he walks up to the player to connect his smartphone. Henrik scans a barcode from the player and his seven albums are automatically shared to the player library. Liv quickly shares all her music from her home library via her phone, and connects to the player similarly to Henrik. The player library now contains Henrik's seven albums and Liv's singles.
Simon has prior to the party also installed the desktop application on his computer and the mobile application on his smartphone. He has added his favorite music to his home library and has, through his mobile phone, shared the same amount of music which is added as soon as he scans a barcode and connects to the MEET player. The player library is updated and now contains Henrik's seven albums, Liv's singles and Simon's music.

Simon afterwards connects his computer to his flatscreen TV, and starts the situated display from the desktop application. He presses play and the system randomly selects five songs, out of Henrik's, Liv's and Simon's shared music, which are displayed on the screen. The first song in the system was shared by Liv and her profile picture is therefore shown on the situated display while the song is playing. Since the song is nominated by the system, a MEET-logo is shown as the nominator and also as supporter, which is the people who voted for the song. The song is streamed directly from her home library and the music

is playing. The situated display shows that six slots are still available for user nominations.

***Voting*:** After the music starts to play, Liv realizes that the system has nominated some songs which she does not like at all. She finds her mobile and navigates to the voting screen. She casts a negative vote on the songs she does not like and a positive vote on the one song that she would like to hear next. Simon disagrees, finds his mobile and casts a negative vote on Liv's song wish and positive votes on the rest. All the songs now have the same rating. Henrik also wants to be part of the voting game and casts a positive vote on one of the songs that Simon has also given a positive vote, just before the currently playing song ends. The song that Henrik and Simon have voted for wins and is played.
Simon has a tablet on which he has installed the MEET tablet application. The tablet is also connected to the player and can be voted from. To be sure that the next winning song is the song she voted for, Liv sneaks up to the tablet and gives this song some extra votes. Simon and Henrik do not notice and Liv's song wins. Some other guests who have not got a smartphone also use the tablet when they want to vote or nominate.

***Nominating*:** Henrik is getting tired of the system choosing random songs to be played, and he therefore navigates to the nomination screen on his mobile phone. From here he can browse through all the music contained in the player library. He finds a song written by his favorite band "Survivor", called "Eye of the Tiger", and nominates it. The song appears on the situated display, but is only showed as the genre "Rock". Henrik is now the only person in the room who knows that the "Rock"-item hides his nominated song, "Eye of the Tiger". The other guests at the party find the new music item interesting and vote for it to find out what song it is. The song wins, and since it is a song shared by Henrik, it is streamed from his MEET library at home and played. Henrik thought that he was the only one who fancied that song, but it turns out that most of the people actually like this 80's hit.
Since the song is both shared and nominated by Henrik, his profile picture is displayed in the now playing area of the situated display. People who voted for the song get their profile picture shown as well.
Throughout the party, people nominate and vote from their smartphones and from the tablet. Sometimes the system gets a lot of attention and invites to small competitions and at other times the system simply ensures that the music never stops.

When Henrik and Liv leave the party, they disconnect from the player via the mobile, and their shared music is automatically removed from the player library.

4.3 Implementation

After spending roughly 1.200 man-hours on the implementation of 14.700 lines of source code, many interesting features of the system could be explored and explained. Because of space limitations only the implementation of a few essential functionalities are described. We have selected some areas to be explained in depth. ID3 tag extraction and streaming are described in detail because of the complexity of implementing the protocols ourselves. The implementation of the nominations is also described in detail to explain the solution of dynamically resizing elements on a confined space. This section goes through the following functionalities:

ID3 Tag Extraction The extraction of metadata from MP3 files.

Streaming The protocols used when streaming music between library and player.

Nominations The concept of nominations.

Barcodes The concept used for connecting a mobile with library and player.

Browsing The concept of browsing a music library used to nominate and share songs.

Voting The concept of voting for songs.

4.3.1 ID3 Tag Extraction

The ID3 metadata tags [19] of MP3 files form the basis of the data exchanged within the system architecture and contain information such as artist, title, genre and album art. Since no free or open source Java library could be found supporting the needed functionality, we implemented our own. The MEET desktop application supports extraction of all currently defined ID3 versions up to and including the latest version.

ID3v1

As shown in figure 4.7, the ID3 tag in version 1.0 is added to the end of MP3 files.

Figure 4.7: Example of the internal layout of an ID3v1 tagged audio file. [20]

The size of the tag is fixed to 128 bytes and the first three bytes of the tag are always the three characters “TAG”. To check for an ID3v1 tag in an MP3 file, the MEET tag extraction functionality will therefore open the file, step 128 bytes back from the end of the file and check if the first three bytes of the file are “TAG”. If so, the metadata contained in the remaining tag should be extracted according the table 4.1.

Header	“TAG”
Song Title	30 characters
Artist	30 characters
Album	30 characters
Year	4 characters
Comment	30 characters
Genre	1 byte

Table 4.1: ID3v1 tag [20]

The single byte of the field is used to denote a numeric value used in conjunction with a lookup table of pre-defined genres, e.g., the binary value of 17 denotes the genre “Rock”. The MEET extraction functionality supports all 126 genres currently defined. [21]

The extension from version 1.0 to 1.1 was to use the last two bytes of the comment field for album track number.
The extraction functionality therefore always extracts these bytes, checks if they can be converted to an integer and saved as the album track number.

ID3v2

To avoid buffering the entire song to extract metadata when streaming, ID3v2 places the tag in the the beginning of the files, as seen in figure 4.8.

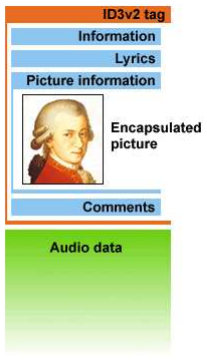


Figure 4.8: Example of the internal layout of an ID3v2 tagged file. [22]

The header of the tag was changed to not only indicate the presence of an ID3 tag, but also inform about the version, the size and other information about the tag as seen in table 4.2.

Identifier	"ID3"
Version	02 00
Flags	xx000000
Size	4 * 0xxxxxxx

Table 4.2: ID3v2.2 header [23]

When checking for ID3v2 tags in an MP3 file, the extraction functionality reads the first three bytes of the file and if they correspond to the characters "ID3", an ID3v2 tag exists.
The next two bytes are then read, which indicate the major and the minor version of the tag, respectively. In table 4.2, the major version is "2" and the minor version is "0", indicating ID3v2.0.
The following flag byte is never used and the extraction functionality therefore simply skips it.
The final four bytes of the header are also broken into bits and are used to calculate the size of the ID3 tag. Contrary to ID3v1, the flexibility of ID3v2 results in no requirements of having certain metadata included and the data can be arranged in any order. For the extraction functionality to know exactly when the tag stops and the audio data begins, the size of the tag must be indicated and read precisely to the byte.
As shown in the table, the first bit of each byte is always zero. This bit is always ignored by the extraction functionality resulting in a total of 28 bits that can represent a size of up to 256MB which is the specified maximum of an ID3v2 tag.
The calculation adds the values of the four bytes according to their significance. As shown in the example in table 4.3, the first of the four bytes represents the largest significance and this ordering of byte significance is called big endian.

Bits of Size Bytes	0000000	0000000	0000010	0000001
Value of Size Bytes	0	0	2	1
Byte Significance	512	256	128	1
Calculation	0 x 512	0 x 256	2 x 128	1 x 1
Result	257			

Table 4.3: Example of ID3v2 size calculation.

The binary calculation of the size is implemented as shown in code example 4.1.

```
1  byte[] bytesTagSize = readBytes(inputStream, 4);
2  int tagSize = ((bytesTagSize[0] & 0xFF) << (7 * 3));
3  tagSize += ((bytesTagSize[1] & 0xFF) << (7 * 2));
4  tagSize += ((bytesTagSize[2] & 0xFF) << (7 * 1));
5  tagSize += (bytesTagSize[3] & 0xFF);
```

Code Example 4.1: ID3v2 tag size calculation.

In line 1, the four size bytes are read from the file input stream and saved in the `bytesTagSize` byte array. Java reads the bytes in the order of little endian and since the calculation assumes big endian, the order of the bytes must be reversed.
Therefore, the byte with the highest significance is calculated in line 2 using the first byte of the `bytesTagSize` byte array. Java handles bytes values as signed values spanning from -128 to 128. The calculation assumes an unsigned value from 0 to 256 and the conversion from a signed to an unsigned value is handled by using the bitwise *AND* operator with the value `0xFF` which corresponds to a byte with the bits `11111111`.
After ensuring an unsigned value, the value must be logically left shifted according to the significance of the byte using Javas bitwise shift operator `<<`. In table 4.4, a bitshifting example is shown, using the third value of the example in table 4.3, corresponding to line 4 of code example 4.1.

Bits of Byte	0000010
Left Shifting by 7 Bits	0000010 << 7 = 00000100000000

Table 4.4: Example of logical left bitshifting.

The value of the byte was 2 but after leftshifting by 7 bits, the value is 256. As shown in the code example, this operation is performed on all four values according to their significance, shifting the value of highest significance furthest. Adding the shifted values together yields the correct size of the entire ID3v2 tag, excluding the header. The size of the tag is saved in a variable which is subtracted the number of bytes read from the MP3 file until the extraction functionality reaches the end of the tag.

The next step is to extract each piece of metadata available in the tag. These are ordered in frames constructed in much the same way as the ID3 tag itself as they have a header and some content. Several types of frames exist, but the MEET system only needs to be able to read text frames and the frame containing the album art.

A frame header always contains at least an identifier and a size, which is calculated in much the same way as the tag header. The latest ID3 version, ID3v2.4, uses the exact same calculation as the tag header, however, ID3v2.2 and ID3v2.3 use 8 bitshifting instead of 7 bitshifting, and ID3v2.2 uses only three bytes for the calculation.

The values of the text frames, such as artist and song title, are free text values, except for genre. If the genre text content starts with the character "(", the next character is the integer lookup value of pre-defined genres to be interpreted similarly as in ID3v1. The text should then end with the character ")" but if additional text is included, this is a refinement of the general genre and is saved by the extraction functionality as the genre to display.

The final frame to extract is the picture frame. Besides the mandatory frame identifier and size fields, the picture frame header has image format, picture type and picture data fields as well. The image format field contains a clear text MIME type, e.g., " image/png". The extraction functionality extracts the text after the "/" character to use when invoking Java functionality in order to save the image in the correct file format. The picture type field is a single byte with the value of 0-14, indicating if the picture is an album cover, a file icon, a picture of the composer and so on. Multiple pictures can be saved in a single ID3v2 tag but the extraction functionality only handles pictures designated as covers. The picture data is extracted as raw byte code and then saved full size as a file for later use on the situated display as well as a downscaled 90x90 pixels picture for use in the mobile application.

All this information is extracted from every MP3 file if available. For music collections of around 2.000 songs, it takes the extraction functionality around 25 seconds to finish the extraction of the data. This is then transferred as XML between the different system parts through remote calls and displayed to the user in the desktop application, the mobile application and on the situated display.

4.3.2 Streaming

The other form of data exchange within the system, besides the ID3 metadata, is streaming of the actual audio data. The data is transferred directly between the library and player parts of the system architecture which are connected by use of the mobile application.

For controlling the home library streaming server, the Real Time Streaming Protocol (RTSP) was chosen. This protocol is extensively used and implemented in high profile applications such as Windows Media Services and QuickTime Streaming Server. Since a free Java library containing the needed functionality could not be found, a custom implementation was developed from the RFC 2326 standard [24].

The RTSP protocol is in many ways similar to the HTTP protocol. The communication is based on TCP using a client-server request-response model. In the case of MEET, the player requesting the audio stream is the client and the library hosting the audio data is the server. As shown in figure 4.9, the RTSP client of the player initiates the streaming communication with the RTSP server of the library through the `SETUP` request.

The two most significant parameters of the first line of such a request, shown in code example 4.2, are the `SETUP` command and the `trackID`.

```
1  SETUP rtsp://192.168.1.123:10001/trackID=10 RTSP/1.0
2  Transport: RTP/AVP;unicast;client_port=10002-10003
3  CSeq: 1
```

Code Example 4.2: An example of the SETUP RTSP command.

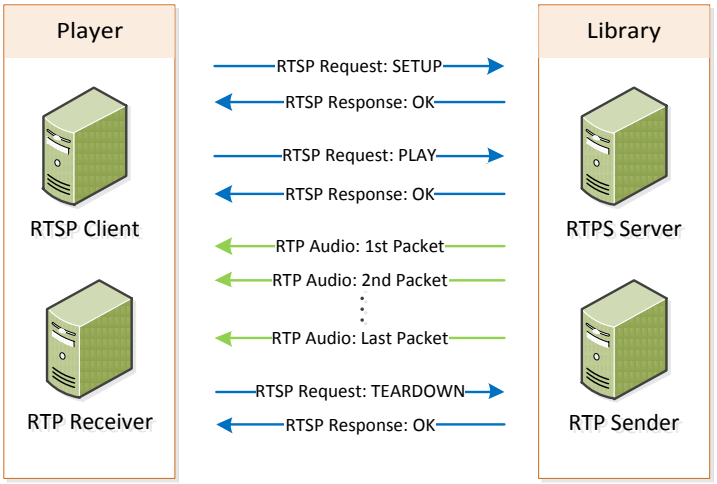


Figure 4.9: Streaming music between a player and a library.

The RTSP server, in this case receiving the request on the IP address `192.168.1.123` and port `10001`, interprets the command and extracts the parameters of the request accordingly. The `trackID` is the unique identifier of the song to be streamed. This prompts the library to locate the MP3 file of the song in question and initiate streaming variables. The library maintains a mapping between IDs and MP3 file paths, and masking the actual file path from the player is done for security reasons. The last parameter, `RTSP/1.0`, indicates the version of the RTSP protocol and is always 1.0.
Line 2 of the code example provides information to the RTSP server about how the client wants the audio data to be transmitted. Since RTSP does not include a means of transferring the actual data, another protocol is needed. The Real-time Transport Protocol (RTP) is the most used data payload protocol for media stream delivery in connection with RTSP and is the natural choice. Again, the search for a free Java library to incorporate directly into MEET was unsuccessful and a custom built library was implemented from the RFC 3550 standard [25]. This enables the RTSP client to request unicast transmission using the RTP protocol on the ports `10002` and `10003`.
The final line of the code example contains the communication sequence number of the RTSP request-responses. The response to a request must have the same sequence number as the request and the number is used to detect missing messages.
If the MP3 file with the requested `trackID` is found by the library, an `OK` response is transmitted back to the player indicating that the library is ready to start sending audio data.

When the player receives an `OK` response to a `SETUP` request, an RTP receiver is started in preparation for the audio data to be sent by the library. The player then sends a `PLAY` request and upon reception, the library initiates an RTP sender. As the last step before starting the transmission of RTP audio packets, the library responds with an `OK`.

As seen in figure 4.9, the RTP packet transmissions are one-way from the library to the player. Unlike the implementation of the RTSP protocol using TCP, the RTP transmissions are sent over UDP. The advantage of TCP is reliable packet delivery through a handshaking mechanism whereas UDP prioritizes speed of delivery. With a simple fire-and-forget approach, packets can be sent faster than over TCP but loses the reliability. This is preferable for the time-sensitive audio streaming transmissions needed within MEET. If a packet is missing, it is more important to keep streaming the rest of the song than to pause the playback and wait for the re-transmission of the packet.

The RTP audio packets are the requested MP3 file split into small pieces of a pre-defined size. The audio data is included as the content of an RTP packet and an example of the RTP packet header of the first packet of an MP3 file sent by a MEET library is shown in table 4.5.

Bit Offset	0-1	2	3	4-7	8	9-15	16-31
Data	Version	P	X	CC	M	PT	Sequence Number
Binary Value	10	0	0	0000	0	000110	0000000000000001
Decimal Value	2	0	0	0	0	14	1

Table 4.5: An example of the first RTP packet header for MP3 data content.

The first two bits of the header indicate the version of the RTP packet where the MEET implementation uses the latest version and therefore always sets the bits to the binary value of two. Since the implementation does not make use of either padding, extended headers or contributing sources, the following six bits are set to zero. The marker bit is application specific meaning the RTP specification does not dictate the use of it. MEET sets this bit in the last packet of an MP3 file to indicate to the player when to safely shut down the RTP receiver. The payload type is always MP3 within MEET and is therefore always set to the binary value of 14 as defined in RFC 3551 [26]. The next 16 bits are used to represent the sequence number of the packets. The number is incremented in each transmission and is used by the player to detect missing packets.

An MP3 file is sent as hundreds of packets with headers as described above and small chunks of audio data as content. When a packet is received, the audio content is the source data read by a `PipedOutputStream` as shown in figure 4.10.

This stream is connected with a `PipedInputStream` and the two streams share an internal buffer. In one end of the buffer the `PipedOutputStream` writes data while the `PipedInputStream` reads data from the other end. The `PipedInputStream` is consumed by an audio player and the dynamic nature of both streams having simultaneous access to the same buffer ensures continuous audio playback while

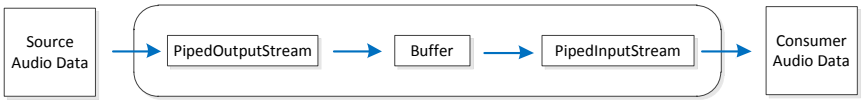


Figure 4.10: Piped output and input streams.

streaming. The audio player waits for 10 RTP packets and then starts playback of the audio data from the beginning of the buffer while the RTP receiver keeps adding audio data to the end of the buffer as it is received.

The last step of the RTSP protocol, as seen in figure 4.9, is to clean up the resources used on both the client and server side which is initiated by the player when the last RTP packet has been received. The `TEARDOWN` request closes all connections created through the transmission process in the library and upon receiving the `OK` response, the player frees all used resources as well.

To the user, the implementation of the RTSP and RTP protocols result in playback of the winning nominations with little delay, even though they have not been transferred in their entirety from a remote home library to a player.

4.3.3 Nominating

Nominations are represented in one of 10 nomination slots on the situated display. The sizes of the nomination representations are relative to each other, due to the space constraint of the situated display. Each nomination is assigned a randomly chosen representation mode which defines what information about the song is shown on the situated display. The representation modes are:

- Album cover
- Owner (the user who has shared the song)
- Nominator (the user who has nominated the song)
- Genre
- Album title
- Artist
- Song title
- Total (shows both artist and song title)
- Unknown (a wild-card where only a questionmark is shown)

Information related to the nominations, is based on ID3 tags. Since these tags are not guaranteed to be complete, a temporary list of valid representation modes for each nomination is generated and a mode is selected randomly from this list. This ensures that no nomination is created where information is incomplete. The owner, nominator and unknown modes are always available.

When a song is nominated, either by a user or the system itself, the same series of actions needs to be executed, handling both the underlying information about the nomination and the visual representation:

1. Check to ensure there is an available nomination slot.
2. Check to ensure that the nomination limit for the user is not reached.
3. Check to ensure the song is not already nominated.
4. If all the previous checks are successful, a nomination object is created and added to the list of nominations.
5. The full-size album cover is retrieved from the home library from where the song is shared.
6. A visual representation is created on the situated display.
7. The set of nomination representation objects is updated in order to resize, taking the new nomination into account.

The nomination object is a data model that, in addition to data about the song, contains:

- The unique user id of the nominator.
- The profile name of the nominator.
- The current rating according to votes cast, which is the sum of all votes.
- The representation mode.
- The full-size album cover.
- The number of songs played while the song has been nominated. This is used to enforce the elimination rule on nominations that have not been voted for during three songs.
- A list of supporters, which is the users who have voted for the song.
- A flag that specifies whether the song has been voted for at some point. This is also used to enforce the elimination rule and is necessary because the system does not save every vote, but instead maintains a total rating.

Some of the data, e.g., nominator profile name, could be retrieved elsewhere but is kept redundantly in these objects for optimization.

The update method used to resize the nominations is the same method called when a nomination is added or removed and also each time a vote is cast. This means that all nomination representations are resized when changes are made to a single item. The choice of having a relative size calculation, is to maintain control of how nominations are represented and avoid growing visual elements out of proportions. Each nomination has a predefined size span going from a minimum of $\frac{1}{10}$ or 0.1 and a maximum of $\frac{1}{4}$ or 0.25 of the height of the situated display. The default size is the median, hence $\frac{7}{40}$, or 0.175. Minimum, maximum and median sizes are predefined, but the rest are calculated according to each rating and uses the following algorithm:

1. A *ratingspan*, meaning the span of all current nomination ratings, is calculated: $ratingspan = max.rating - min.rating$
2. Because ratings can be negative, they are all converted to a positive rating to ease comparison: $positiverating = rating + (-min.rating)$
3. The proportion of the rating is calculated: $proportion = positiverating/ratingspan$
4. The rating proportion is mapped to the size of nomination representations: $size = min.size + (sizespan \times proportion)$

Which yields the formula shown in equation 4.1.

$$size = minHeight + \left\lfloor (maxHeight - minHeight) \left(\frac{rating + (-minRating)}{maxRating - minRating} \right) \right\rfloor \tag{4.1}$$

The result is that all nomination representations are placed within the size span relatively to each other without . For optimization, if the rating span is calculated to zero, all nominations must have the same rating, hence there is no need to calculate the same size for each item, and they are all resized to the default size. Since the nominations are quadratic the size is used for both height and width.
An example of a size calculation is shown in equation 4.2 with the following parameters:

```
Screen resolution: 1920 x 1080
Maximum rating for any nomination: 6
Minimum rating for any nomination: -3
Current rating: -2
```

$$\begin{aligned} size &= 1080 \times 0.1 + \left\lfloor (1080 \times 0.25 - 1080 \times 0.1) \left(\frac{-2 + (-(-3))}{6 - (-3)} \right) \right\rfloor \\ size &= 126 \end{aligned} \tag{4.2}$$

4.3.4 Barcodes

To connect to both library and player from the mobile, data matrix codes are used [27]. A data matrix is a two-dimensional barcode consisting of white and black fields placed in a rectangular or quadratic figure as seen in figure 4.11. The decoded data matrix is a text string containing all relevant information for the mobile to communicate with library and player, respectively.

Figure 4.11: An example of a data matrix.

Library: The library barcode contains the following string, where text surrounded by "¡¿" are variables and "—" is used as a separator:

```
MEETL|<Library Name>|<IP-address>
```

The three parameters are used as follows:

- The first parameter, `MEETL`, is used to identify the scanned code as a MEET code and that it is a code generated from the library side of the application.
- The second parameter, `<Library name>`, is used to give feedback about which library the mobile application is connected to.
- The third parameter, `<IP-address>`, is the external IP-address of the library which is used by both the mobile and player for remote calls and streaming.

Player: The player code contains the following string:

```
MEETP|<Player Name>|<Unique User ID>|<IP-address>
```

The four parameters are used as follows:

- The first parameter, `MEETP`, is used to identify the scanned code as a MEET code and that it is a code generated from the player side of the application.
- The second parameter, `<Player name>`, is used to give feedback about which player the mobile application is connected to.

- The third parameter, `<Unique User ID>`, is a unique identifier generated by the player used to identify the connected mobile devices. The mobile device connections are saved as objects that hold all relevant information such as IP-address, the shared songlist and profile name.
- The fourth parameter, `<IP-address>`, is the external IP-address of the player which is used by both the mobile and library for remote calls and streaming.

The data matrix barcode functionality used to encode text strings and generate the barcode graphics is the free Barcode4J java library which has been incorporated into the desktop application. In the mobile application the open source ZXing library is used to scan and interpret barcodes. When the mobile has scanned a code from either the library or the player, the given parameters are processed and saved in a file in the internal storage, only accessible from the MEET application [28]. Saving these files means that the user does not have to connect to the library more than once, as long as the library retains the same IP-address. Furthermore, if the user accidentally closes the mobile application during a party, the user can start the application again without loosing connection to the player.

Changes from First Prototype: The first prototype, developed during the first semester of the master's program, handled the connection to the library by manually entering IP-address and port of the library in the mobile. Connection between mobile and player was done by means of generated six-digit codes which should be entered in the player. When connecting to a player the mobile should initially request a code from a webserver. The code should then be entered in the player after which an Internet-based data exchange would happen between the two modules. This form of connection setup introduced issues such as, manually entering the code created a risk of the user mistyping the code, which complicated the connection process. Introducing the use of barcode scanning eases the process; the user has no responsibility in the connection setup since all processing and data exchange happens behind the scene when the user scans a code. Since the intermediary webserver is completely phased out, as described in section 4.1.1, the connection configuration lies solely between the mobile and the library or the mobile and the player.

4.3.5 Music Browsing

Because of potentially large music libraries to browse through from the mobile application, the implementation of the browsing functionality is considered important. When arranging and sorting the music in the system, we work with four different browse criteria; Genre, Artist, Album and Title. When browsing, the user can choose one of these four levels each resulting in a list containing up to 15 items which are listed in alphabetical order. The number of 15 is chosen as a compromise between fetching a large amount of data one time and fetching small chunks of data many times. Although an overhead is introduced at each call, the response time for the user is short on small data chunks. On the other hand, since the music libraries can contain thousands of songs, representing an entire library on one page will require an extensive amount of data to be downloaded and will increase the response time considerably. Furthermore, retrieving the entire data set would result in an extensive amount of excess data.

Figure 4.12 shows an example of browsing through all four browsing levels.

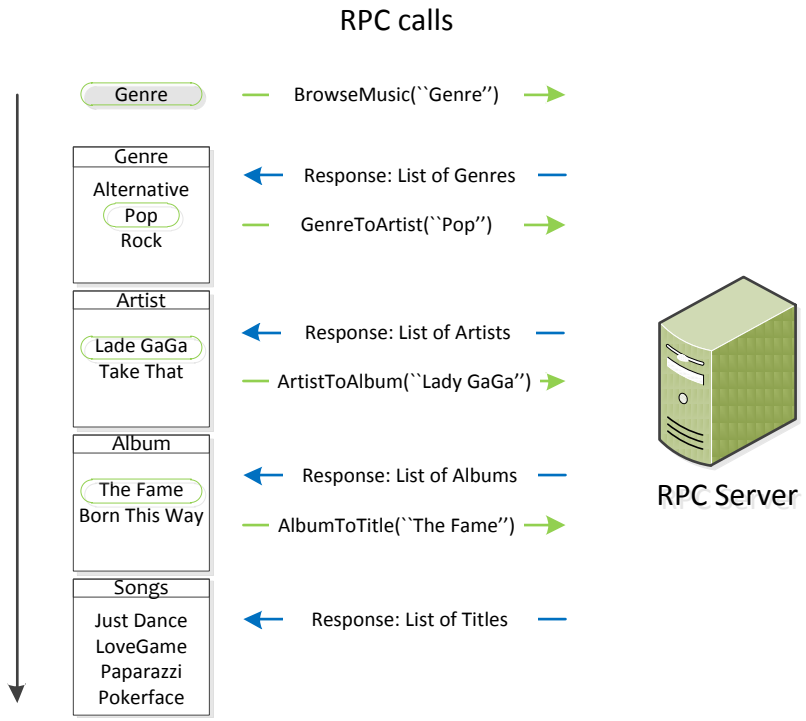


Figure 4.12: Music browsing through the four browsing levels.

Clicking the genre button results in a list containing genres from the music library. When the user selects a genre, in this case Pop, a list of artists composing music in this genre is fetched. Tapping an artist in the resulting list, gives a new list containing all the albums from the chosen artist. Likewise, tapping an album in the album list, the user will reach the lowest browse level containing individual songs from the chosen album.
The three browse levels allow the user to select an item on that level which takes the user to the immediately lower browse level. Each time the user requests a new list of browse items, the mobile application sends a remote procedure call (RPC) to an RPC server in the desktop application.
If the user requests a list of artists using the functionality for artist browsing, the given handler searches the music library and finds all distinct artists. If the list of artists exceeds 15 items, the handler sends a response containing a list with 15 artist items and a number indicating how many pages of 15 artist items can be fetched. This number is generated from a simple calculation; $numberofartists/15$ rounded off.
From the response, the mobile displays a list of up to 15 artists. The mobile furthermore holds an internal counter which is compared to the number in the response to determine whether the “next” and “previous” button should be en-

abled or disabled. For each call made from the “next” button, the counter is increased by one, and opposite, from the “previous” button, decrease by one. In the first call the “previous” button is automatically disabled, but from the second call to the last, this button is enabled. When the number in the response and the counter are equal, the last browsing page is reached, and the “next” button is disabled. Until that, clicking the “next” button on the mobile will fetch the next 15 items in the browsing category.

At the lowest levels, Album and Title, the user can swipe an album to share all the songs on the album or swipe a single song to share or nominate it.

4.3.6 Voting

The nominations are mapped to a list in the mobile application allowing the user to vote for or against each song or leave it in the neutral position. Table 4.6 shows the voting scheme of the voting combinations. The table should be read first horizontally from the left and then vertically, e.g., plus to neutral gives a rating of -1. The N/A indicates that the voting, from one position to the same position, is not possible. Each nomination object has a rating, which is updated each time a vote is sent from a connected mobile. All the votes from the mobiles are summed up on the player and the song is rated according to the total vote value. At the end of each song, the nomination with the highest rating wins and is played.

	Minus	Neutral	Plus
Minus	N/A	+1	+2
Neutral	-1	N/A	+1
Plus	-2	-1	N/A

Table 4.6: Voting Scheme

After a vote is cast, the general resizing method is used to adjust the relative sizes of all nominations, according to the new value.

If a song has been played, or has been eliminated due to the elimination rules described in section 4.2, it is not possible to cast a vote on this song. Each time a vote is given from a mobile, the mobile application checks if this song is still available, since the nomination list might have changed since last time a vote was cast. If the song is unavailable the user is notified and the voting list is updated.

4.4 Interface Design

The design of the situated display and part of the mobile application is a direct result of the workshop described in section 3.1.1. The control of the system by nominating and voting was developed and refined during the workshop which heavily influenced the final outcome of the designs. While the iterative prototypes developed afterwards at times strayed from the originally developed designs, what we ended up with was remarkably close to the workshop sketches.

The five parts of the system architecture, as described in section 4.1, are the library, player, situated display, mobile and tablet. The interaction designs of these parts will be described in this section, with the library and player parts combined into the section called "Desktop Application".

4.4.1 Desktop Application

The MEET library and player have been incorporated into the same desktop application to make the installation process as simple as possible. They were treated separately when designing the overall system architecture, therefore share most of the interaction design elements. The desktop application is running on all the three major operating systems; Windows, Mac OS and Linux.

The finished design of the main screen of the desktop application can be seen in figure 4.13.

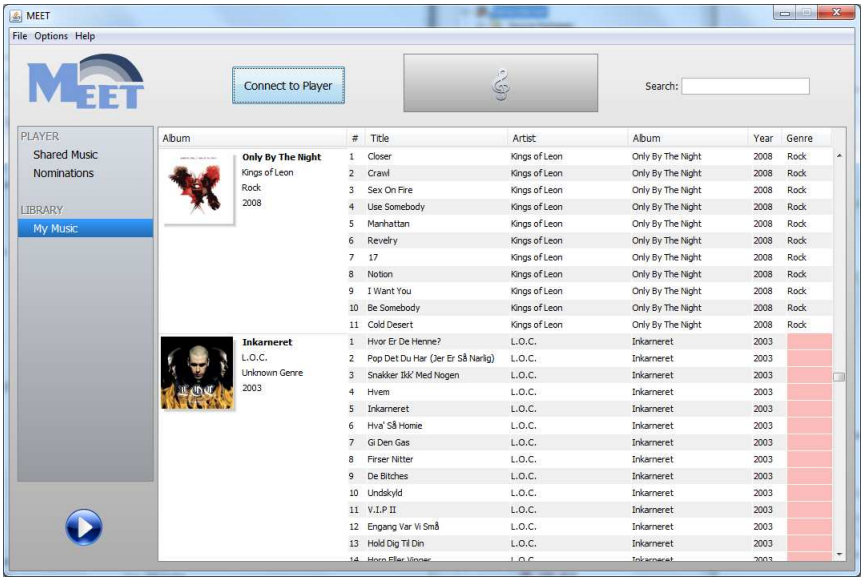
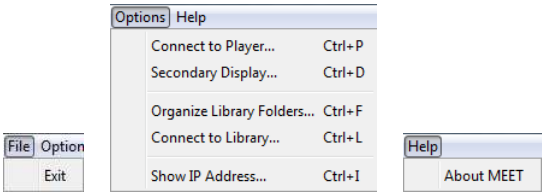


Figure 4.13: The MEET library.

Menu Bar

The menu bar contains three elements, as shown in figure 4.14. The main subitems, grouped under the "Options" header, have keyboard shortcuts assigned which are displayed to the right of the title of each subitem.



(a) File (b) Options (c) Help

Figure 4.14: Elements of the menu bar at the top of the main screen.

The "Exit" subitem of figure 4.14(a) and the "Show IP Address" subitem of figure 4.14(b) are self-explanatory and the latter is mainly used to make sure that the application has picked up the correct IP address if the mobile application cannot connect. The "About MEET" subitem in figure 4.14(c) displays a short description of the system, as well as our names and contact information.

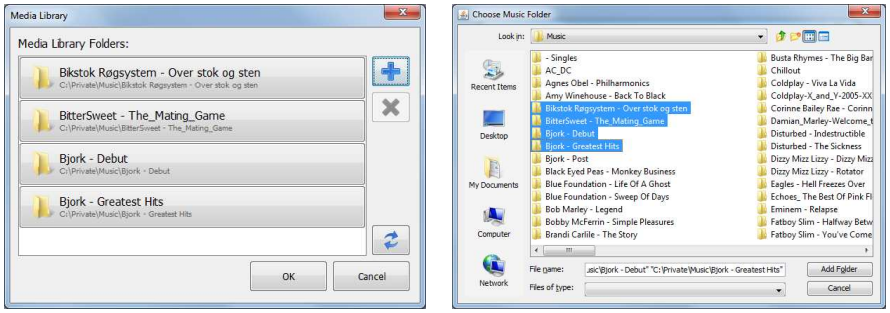
The "Connect to Player" functionality of figure 4.14(b) displays a player barcode that the mobile application needs to scan in order to interact with the player. As seen in figure 4.15, the barcode scanning can be cancelled from the player until a connection has been successfully made.

(a) Before connection (b) After connection

Figure 4.15: Mobile application settings.

To include a situated display, one must connect it to the computer running the player, include the display in an extended desktop configuration and then click the menu element "Secondary Display". This will open a secondary window and double clicking anywhere on the background of the new window will maximize it on the situated display. It contains all the graphical elements needed and is updated automatically when the player is playing music.

Clicking the "Organize Library Folders" element opens the music folder window, as shown in figure 4.16(a).



(a) Selected folders (b) Adding new folders

Figure 4.16: MEET library folder selection.

From there, the user can add folders to the list by clicking the plus icon, using the common annotation associated with plus being addition, in the top right corner which opens a folder selection window as shown in figure 4.16(b). Removing folders is done by marking one or multiple folders and clicking the X icon which is automatically enabled when marking folders and which has the common annotation of closing or deleting.
The folders included in the list indicate to the system which folders to search for music files in. When the music library is updated the application will extract ID3 tag information, such as artist, title and genre, from every MP3 music file located in the selected folders and their subfolders. This is the metadata that forms the basis of the information the system exchanges between library, mobile and player besides the streaming of the actual music.
The music library is updated either directly, by clicking on the icon with the revolving arrows commonly used by, e.g., browsers to indicate a refresh functionality, or by clicking the "OK" button. An exception to the latter is if no change has occurred in the list of folders, meaning no new folders have been added and no folders have been removed, clicking "OK" will yield the same result as clicking "Cancel". Making the system search through all folders and subfolders and extracting every bit of information from thousands of discovered MP3 files can take a couple of minutes. By preventing unnecessary processing, the application will not lock up and prevent the user from performing other tasks within the program.
To provide access to the library from a mobile phone, a barcode is generated, shown in figure 4.17, containing the connection information. Similarly to the player barcode, this must be scanned in order to interact with the library.

Figure 4.17: A MEET library barcode.

Main Content

In figure 4.18, the main content section of the desktop application is shown. The displayed dataset is controlled by the side bar menu and can change between the metadata of the private music collection, shared music collection or the nomination list. Since voting works best with as much information available as possible, the missing information is highlighted in red. In the figure, the genre extracted from the MP3 files of the last album displayed in the table by *Suspekt* has not been saved in the ID3 tags and is therefore highlighted.

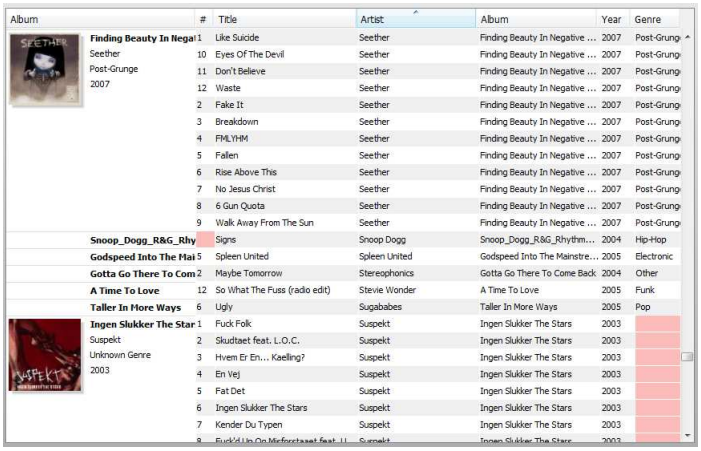


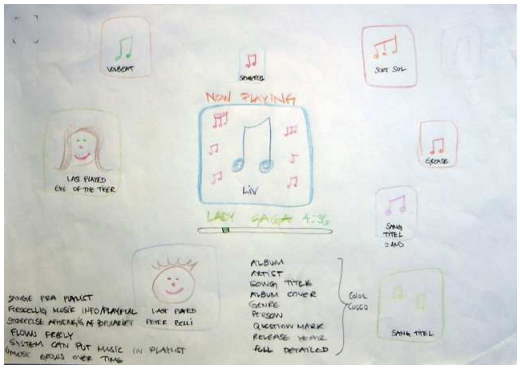
Figure 4.18: An example of the main content section of the desktop application.

The metadata is displayed as a list of songs in a table. A functionality checking for similar, consecutive songs in the table, group them together by expanding the first row in the first column containing the album information to span the first column for all the songs of that album. As seen in figure 4.18, the first album listed, "Finding Beauty in Negative Spaces" by "Seether", has all songs on the album grouped together by the first column of the table. The following five albums in the table consist of only one song each and there is therefore not enough room to display the album art, artist, year or genre of the album. All the information of an album is only displayed in the first column if five consecutive songs or more belong to the same album. Since not all albums necessarily have that many songs and all songs on an album might not have the same information stored in the ID3 tag, it is necessary to show all the extracted information in the row of each song.

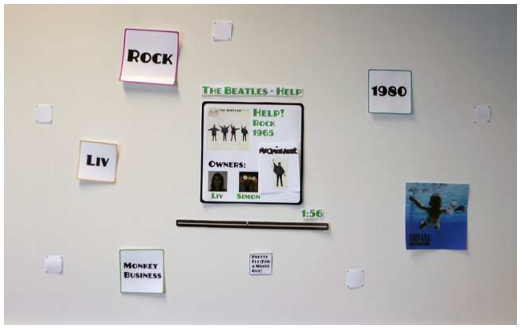
The table can be sorted ascending or descending by clicking the column headers as is common practice when representing data in tables. In the figure, the table is sorted by artist, marked by the light blue color of the "Artist" column header. No matter how the table is sorted, the background of every other row is colored light grey in contrast to the generic white background of the table which is done to aid in visually differentiating the rows from each other.

4.4.2 Situated Display

The situated display is a central part of the MEET system. The system can function without a situated display but in a rather crippled form as important information is only displayed there, such as the indication of which song is leading the voting game and will be played next.
The design of the display is a direct result of the workshop described in section 3.1.1 and the process from sketch to actual design is shown in figure 4.19.



(a) Workshop sketch



(b) Workshop mock-up

(c) Actual design

Figure 4.19: The conceptual workshop sketch, the detailed mock-up and the actual design of the situated display.

An important design factor, for the situated display, is that the interaction is more abstract than single-user point-and-click, touch or remote control. The situated display acts more as a status screen, than a direct interaction interface. It is a device in the background intended for the user to regularly check up on, rather than interact continuously with for long periods of time. The center of attention is therefore a "Now Playing" element displaying information about the current song playing, which the user is not directly manipulating. Nominations are placed around this element, "floating" around as equal candidates. If the nominations were listed they would constitute some sort of order, even though they might have the same rating.

Free nomination slots are placed in the same spots as current nominations, suggesting that they are ready to be filled out and are directly replaced with a nomination when a song is nominated.

Now Playing

The consistent quadratic element form is chosen to resemble a CD case, which is a familiar representation of music to most people. A close-up of the now playing element is shown in figure 4.20.

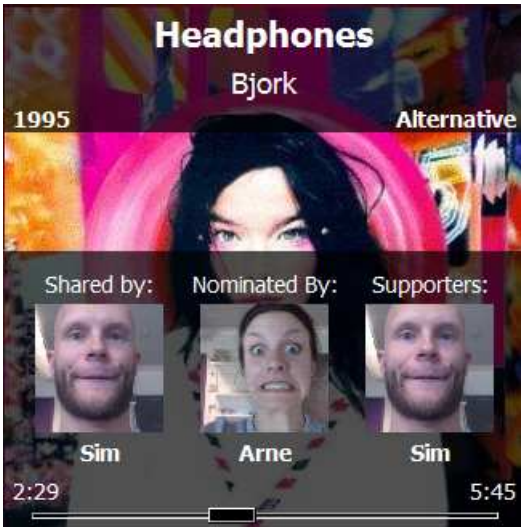


Figure 4.20: The element showing the current song playing on the situated display.

Even music published without a physical release often has quadratic cover art, as a representation in the digital music store and attached to the album or single when downloaded. During the design process the three-part composition of the now playing element has been revisited. The idea was initially to emphasize the song progress bar and the title of the song by having them enlarged at the top and bottom. Instead a design was chosen where all information, about the current song, is encapsulated inside the quadratic representation, ensuring a

consistent design which reinforces the notion of nominations being candidates for the songs played in the center.
The figure illustrates how identity is emphasized by letting the shared by, nominated by and supporters elements take up more space than the actual song information. Since the supporters, unlike the other two user oriented elements, can contain profiles of multiple users, it is chosen to keep it as a single place holder and let the different profiles be shown in a rotation sequence. Multiple supporters could be shown simultaneously in an additional space, but it was deemed more important to keep the quadratic layout intact, as well as maintaining a certain size of the profile pictures. Using the album cover art as the background, instead of having it as an element inside the box, was a change made from the original design that further reinforces the familiar music representation.

Nominations

The idea of letting size represent the winning chance of nominations was a part of the original concept and has been followed through in the development as seen in figure 4.19. The intention is to give the user an impression of a more dynamic music selection than a conventional queued playlist. It may not be as easily interpretable as a list of songs, but it breaks away from a sequential order. It is important to remember that even though the nomination ratings are quantifiable, they do not represent a sequential song list. The representation reflects this by making a more abstract design, that gives the user a different user experience.

The other major design choice, from the original concept, is to show a randomly selected piece of information about each nomination. The goal is to add to playfulness, rather than making nominations as recognizable as possible. Not only does these representation modes contribute to the user experience, it is furthermore a feature that enables valuable data in the field study. It makes it possible to compare different information about songs in respect to user response. In this particular case, it is especially interesting to be able to see if users have any interest in the identity aspect of the concept. This is accomplished by having the two representation modes: “Shared by” and “Nominator”. These two representations contain a profile picture and the username, of the person who has shared or nominated a particular nomination respectively. Figure 4.21 shows how the song *Lucy in the Sky with Diamonds* by *The Beatles* would be represented in all nine representation modes, if it was both shared by and nominated by the same person. It furthermore shows how empty nomination slots are represented.

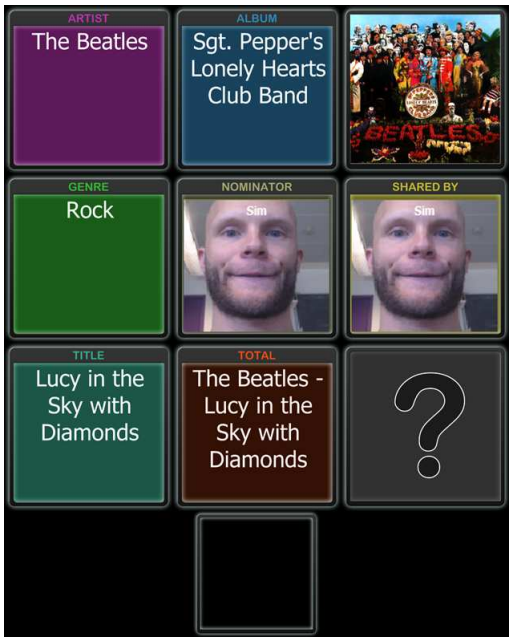


Figure 4.21: Examples of the nine representation modes and the empty nomination slot.

A challenge in the visual representation is to make nomination elements recognizable, even when they are unpopular and hence small in size. This was handled by assigning a specific background color to each representation mode, that would be consistent on the mobile application. Each representation mode would furthermore have a header, on the situated display, describing the mode.

Nominations are initially placed randomly and afterwards keep their position, helping the user to keep track of nominations. Since size is the only indicator of popularity and the nominations are placed in a non-sequential order, there is no need to reallocate elements. Each nomination element also has its own space, wherein it can grow and shrink, to avoid that nominations overlap visually and thereby increase difficulty for the user to map elements between the mobile application and the situated display.

4.4.3 Mobile Application

The mobile application is what ties the system together. It is the center of interactivity, connecting with both the MEET library and the player. It is responsible for communicating the connection information necessary for the player to stream songs from the libraries. It also act as a control device in the nomination and voting process when interacting directly with the player in the ongoing battle of which song to play next.

Two ways of interacting with touchscreens are common to most smartphone operating systems, including Android, namely tapping and swiping. It can therefore be assumed that users have already learned these before using MEET and expect a certain behaviour when using the them. Tapping is the equivalent of clicking with a mouse when interacting with a computer and swiping is keeping contact with the screen using a finger while moving it from one point on the screen to another. These two interaction methods are used heavily throughout the interaction designs of the mobile application.

Figures including more than one image are an ordered sequence of events, shown during interaction.
The startup screen of the mobile application is shown in figure 4.22.

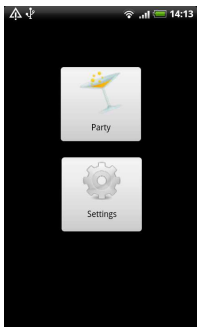
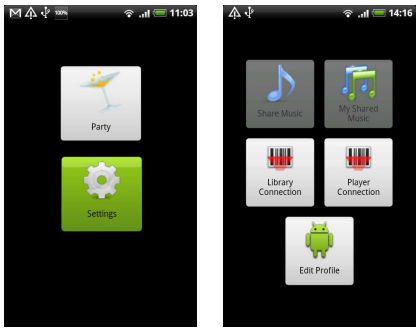


Figure 4.22: Mobile startup screen.

Users are not required to have a MEET library installed and can interact with a MEET player without a library connection. The most used functionality of the application is interacting with a player by nominating and voting for songs to be played. These features have therefore been grouped under the "Party" menu, accessible by tapping the top button directly available on the startup screen. The remaining functionality of the application is used less often and is therefore grouped under the "Settings" menu, accessible by tapping the bottom button. This menu includes setting up a connection with a MEET library, setting up a connection with a MEET player, selecting which parts of the private music collection from the library to share with a player and setting up a user profile, including profile picture and profile name.

Settings

The first step to be performed when setting up any of the functionalities of the mobile application, is to navigate from the startup screen to the "Settings" screen, as seen in figure 4.23.



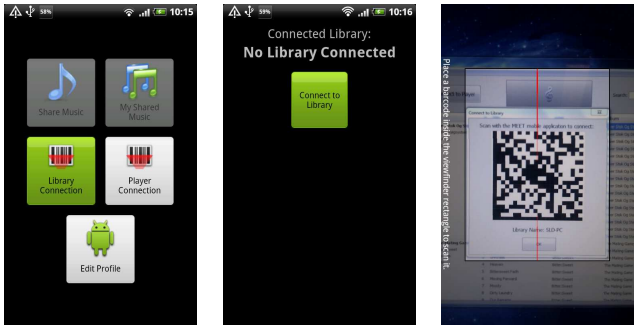
(a) Startup (b) Settings

Figure 4.23: Mobile application settings.

The top two buttons are arguably the most important features of the "Settings" screen which is why they have been grouped together side by side at the top of the screen. The icons of the two buttons indicate a difference between the two features. The icon of the leftmost button is a single musical note, indicating that ones home library is only available to one self. The icon of the rightmost button is multiple notes, indicating that the shared music is available to multiple users. The two buttons in the middle connect to a library and a player, respectively. The similarity of the two features are mirrored in the icon of the buttons, indicating the barcode scanning functionality for both buttons.
The last button at the bottom of the screen is the "User Profile" button. An icon of the Android mascot has been used to indicate a user entity as this currently is the only platform the mobile application is implemented on.

Home Library Connection

In order to connect to a home library and scan a connection barcode, shown in figure 4.17, the user must navigate to the "Settings" screen, followed by the "Library Connection" screen, as seen in figure 4.24(b).



(a) Settings (b) Home library connection (c) Barcode scanner

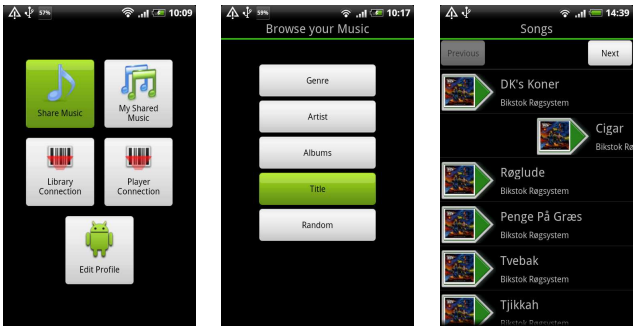
Figure 4.24: Home library setup from the mobile application.

The screen shows if the user is already connected to a library by displaying the name of the library. If not, a standard "No Library Connected" message is displayed. Tapping the "Connect to Library" button takes the user to the barcode scanner functionality, as shown in figure 4.24(c). Centering a MEET barcode in the middle of the screen, as indicated by the semi-transparent viewfinder rectangle, the red line in the center of the screen and the help text displayed on the left side of the screen, enables the application to recognize and interpret the encoded connection information. When the processing of the information is done, the application can connect to the library and transfer this connection information to a player when connected to one.

The next step is to select which parts of the music collection should be shared when connecting to a player.

Sharing Music

Once the library barcode has been read by the scanner, the user is redirected back to the "Settings" screen. Before a connection with a library is made, the two top buttons, "Share Music" and "My Shared Music", are disabled in this screen. As shown in figure 4.25(a), they are, however, enabled when a connection is successfully made. Tapping the "Share Music" button when it is enabled redirects the user to the browsing menu from where they can browse their music collection through the connection with the library, as shown in figure 4.25(b) and 4.25(c).

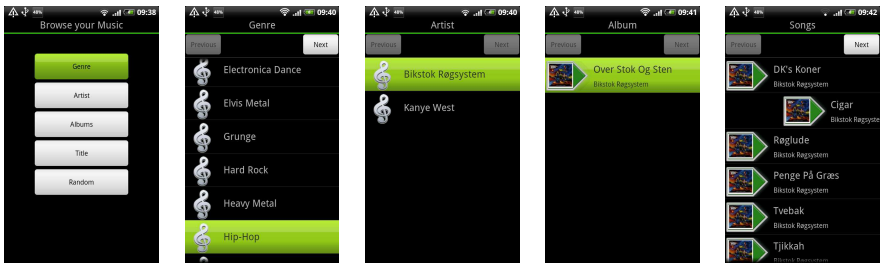


(a) Settings (b) Browsing (c) Swiping

Figure 4.25: Music sharing from the mobile application.

Several levels of browsing through a music collection exist, with the top level being by genre, followed by artist and album, with the lowest level being individual songs. If the user starts browsing at a high level, e.g., by genre as shown in figure 4.26(a), they will be presented with a list of available genres which is a compilation of all the genres within the music collection, see figure 4.26(b). When a genre is tapped, the next level is the list of artists with songs of that particular genre, see figure 4.26(c). Tapping an artist results in a list of albums in the collection of that artist as seen in figure 4.26(d). The album level is the first level, from where the user can share music. Swiping an album from left to

right, indicated by the green arrow containing the album art, results in sharing all songs on that album. If the user taps an album instead of swiping it, a list of songs on the album is shown as seen in figure 4.26(e). As with albums, individual songs can be selected by swiping the green arrow from left to right. This offers a more fine-grained selection than sharing albums.



(a) Browsing (b) Genre (c) Artists (d) Albums (e) Songs

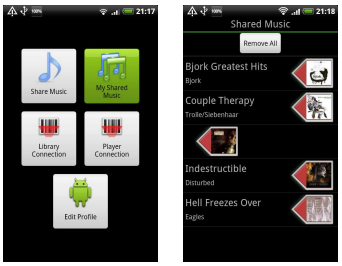
Figure 4.26: Music browsing from the mobile application.

Every browsing page is limited to show 15 items. If more than 15 results exist, the "Next" button in the top right corner of the screen is enabled, as can be seen in, e.g., figure 4.26(b), and can be tapped to retrieve the next 15 items. On pages beyond the first page, the "Previous" button in the top left corner of the screen is enabled and can be used to return to the page immediately preceding the current page.

The "Next" and "Previous" buttons work horizontally within the different levels of browsing, meaning if the user is browsing at the artist level, only pages with artist items will be shown when tapping the buttons. The browsing functionality has been expanded during tests of the system, by implementing vertical navigation, meaning the possibility to return to the previous level of browsing. All Android phones have a native "Back" button which is used for this purpose.

Remove Shared Music

Tapping the "My Shared Music" button from the "Settings" screen, as shown in figure 4.27(a), not only provides the user with an overview of the items currently shared.



(a) Settings (b) My shared music

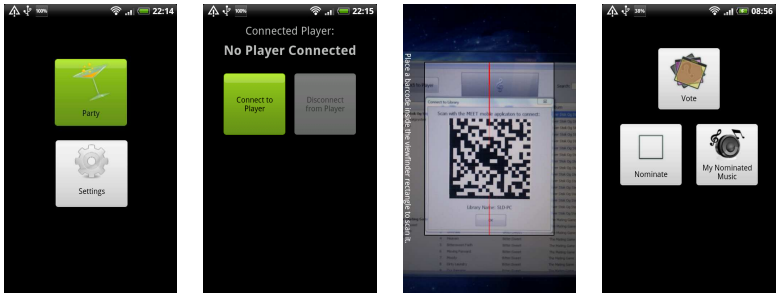
Figure 4.27: Unsharing music from the mobile application.

When unsharing an album or a song, the swipe functionality used when selecting items for sharing is reversed. When sharing, the user must swipe from left to right using the green arrow. As seen in figure 4.27(b), the user is presented with a red arrow that must be swiped from right to left to undo the previous action of sharing an item. Using the common annotations of positive and negative to the colors green and red respectively, substantiates the design of adding or removing items.

Performing the reverse action to undo a previous action is an attempt to provide an intuitive mapping easily understood by the users.

Choosing to Party

Whether users have set up a library or not, they have the option, when first starting the application, of going straight into the "Party" menu containing the most used functionality by tapping the designated button at the startup screen shown in figure 4.28(a).



(a) Startup (b) Player connection (c) Barcode scanner (d) Party

Figure 4.28: Player connection setup from the mobile application.

If they have not yet established a connection with a player, they are redirected to the "Player Connection" screen, shown in figure 4.28(b), which is also available through the "Settings" screen. Similarly to the "Library Connection" screen, the screen shows the name of the player, if the mobile is connected to one. If

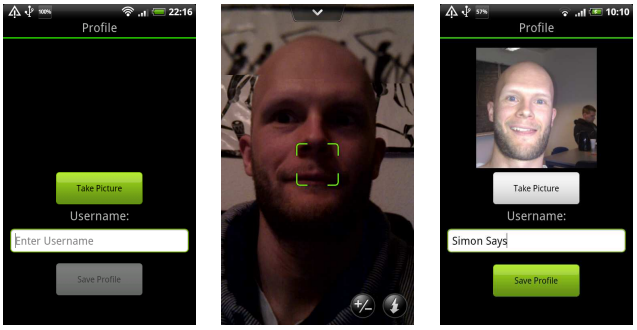
so, the “Disconnect from Player” button is enabled. When tapping the button, the user will not only disconnect the mobile phone from the player but also remove all songs from the shared library, player library and nominations. This is done by removing the library connection information from the player and thereby effectively preventing the player from connecting to the library again until the user reconnects. If the currently playing song is from the library of the disconnecting user, the song will continue playing until the end, to prevent an untimely and abrupt change in the music.
When tapping the “Connect to Player” button, the user is redirected to the barcode scanner as shown in figure 4.28(c), similarly to when connecting to a library. When the player barcode has been successfully processed, the user is redirected to the “Party” screen, as shown in figure 4.28(d).

Nominating and voting for songs are equally important to the system, however, the voting functionality is presumably used more often than the nomination functionality and therefore, the voting button has been placed as the top button on the screen. The icon of the button is a collection of possible song representation modes when shown on the situated display. This provides a mapping between the situated display and the mobile device and helps the user quickly identify the relation between the button and the underlying functionality.

The bottom two buttons, "Nominate" and "My Nominated Music", are grouped together by placing them next to each other horizontally. The icon of the former is a representation of an empty nomination slot on the situated display which, as with the voting icon, helps the user understand the functionality of the button. The icon of the latter is a picture of a speaker, indicating that the songs nominated by the user might get played.

User Profile

If a user profile has not been created when tapping the "Connect to Player" button, the user is redirected to the "User Profile" screen, shown in figure 4.29(a), which is also available through the "Settings" screen.



(a) Empty profile (b) Camera (c) Completed profile

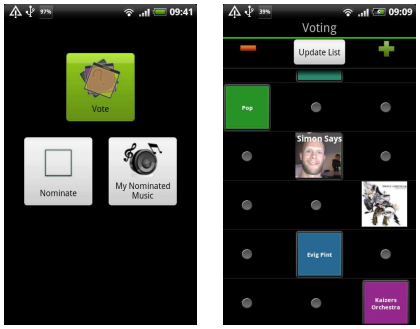
Figure 4.29: User profile setup from the mobile application.

The first time the screen is opened, a picture must be taken using the mobile phone camera, as shown in figure 4.29(b), and a profile name must be entered before the "Save Profile" button is enabled, as shown in figure 4.29(c). After this, the user can continue connecting to a player. This ensures, that a complete user profile is always created before connecting to a player for the first time which is important for the field tests. Requiring that the user takes a picture with the built-in camera of the mobile phone, pushes the user to take a live, spur of the moment picture and not just use an existing picture.

The profile picture and the profile name are shown on the situated display if the user has shared, nominated or voted on a song that gets played and can be changed at any time under the "Settings" menu. Additionally, it enables the system to create nominations with the representation modes "Shared by" and "Nominator".

Voting

A mapping is needed between what is shown on the situated display and on the voting screen in the mobile application to provide users with an understanding of which nominated songs are available for voting. Users must understand which nominations they can vote for as well as how the voting system itself works, e.g., how many votes does a single user have and how will a vote affect the nomination. The voting functionality is shown in figure 4.30.



(a) Party (b) Voting

Figure 4.30: Music voting from the mobile application.

Because of the limited screen design space on a mobile device, compared to the size of a home flatscreen TV used as a situated display, a one-to-one mapping is not a suitable solution. Instead the mapping can be reduced from being accurate in the size differences and placement of the nominated songs on the situated display to simply listing the songs using the correct color-coding for representation modes, in the case of figure 4.30(b) being genre, nominator, album art, song title and artist, respectively.

The voting screen sorts the songs in the order of earliest nomination first, and not by which song has the most votes. This will encourage the user to check the situated display relatively often to obtain information about which nominations are leading the voting game of being the song played next. In turn, this increases the likelihood of users noticing the other important action on screen, i.e., the "Now Playing" information in the center of the situated display. As explained in section 4.4.2, this entity shows general information about the song currently playing, such as artist, title and genre, and, more importantly, the profile information of the users who own, have nominated or have voted on the song. Stimulating the users to view this information often, increases the chance that the profiles shown, subsequently encourage the viewers to want their profile to appear. This potentially results in an increased use of the system in all three categories of participation, being sharing, nominating and voting on music.

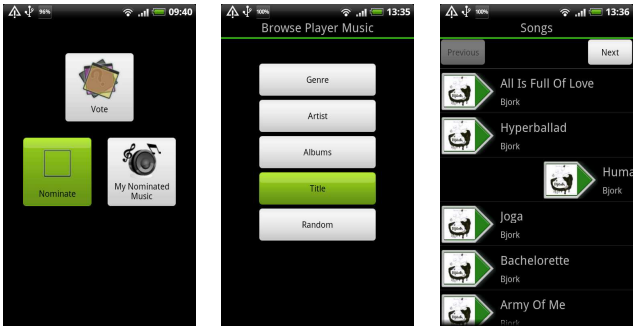
The voting scheme of having a -1, 0 or +1 vote per nomination is indicated by the red minus and green plus signs at the top of the screen. The common annotations of negative and positive for red and green, are used to substantiate the design. The nominations are ordered in three vertical columns mapping

directly to the value of the votes given, and are initially placed in the neutral column in the middle of screen. Small, round buttons are placed horizontally in the two empty columns for each nomination to indicate that an action can be performed by tapping them. When one of the small buttons are tapped, the nomination in the affected row and the button itself change places after the vote has been processed by the player. This ensures that when the nomination is moved to a new column, the vote has been correctly cast, processed by the player and nominations on the situated display have been updated. As a result, a nomination can never be shown in a wrong position on the voting screen.

The votes can be updated at all times as long as the nomination has not been removed. Nominations are updated when the user opens the screen by either navigating away from and back to the voting screen or by waking the phone from sleep mode. If the user keep the voting screen open and prevent the phone from turning the screen off, the list will therefore not update. This results in new nominations not being shown and removed nominations not being taken off the list. To remedy this, the "Update List" button at the top of the screen can be tapped in order to retrieve the current list from the player manually. The list is also automatically updated if the user does not realize that they are voting on a deprecated version of the list of nominations and try to vote on a nomination that has been removed. In this case, a popup message explains that the vote was not correctly cast and why.

Nominating Music

The design of tapping for increased detail of the music collection and swiping for selecting items when browsing a home library is reused when the user nominates music in the "Nominate" functionality under the "Party" menu as shown in figure 4.31.



(a) Party (b) Browsing (c) Swiping

Figure 4.31: Music nomination from the mobile application.

This ensures the same form of interaction when browsing music libraries. The only difference between browsing the player library and the home library is the ability to select albums by swiping. This is allowed when sharing music but not when nominating which forces the user to select nominations at the lowest

level of granularity. To a certain extent this prevents spamming of the limited number of 10 nominations where a single user could nominate an entire album and thereby fill all the empty nomination slots.

Remove Nominated Music

Viewing ones current nominations and removing them is similar to "My Shared Music" screen, as explained in section 4.4.3. Again, swiping a red arrow instead of a green arrow in the reverse direction, as opposed to the action of nominating music, is a simple and easily understood mapping and reusing the interaction design ensures a limited number of different designs for users to learn.

4.4.4 Tablet

The tablet application is basically a limited version of the mobile application. It is a device with the primary purpose of offering participation, to users without an Android device, by letting them nominate and vote for songs. Because it is a common device there is no user profile to be set up, hence no visual representation of each specific user of the tablet. The tablet connects to the player just like each mobile device, but with *MEET* as the profile name and the MEET logo as the profile picture, predefined. A solution was considered, where the user could create an account and log in each time they started using the tablet, but it was deemed more important to keep the use as simple as the mobile application. Even though users would be able to be represented visually via the tablet, the use would be quite different and it could possibly decrease the use of the tablet. Another problem would be, that we would not be able to control whether a single account would represent a single person, or if some people would create multiple accounts.

Another important difference, between the mobile application and the tablet, is the voting system. Because the mobile application only allows one vote per song it is not suitable for a common device. If the user had an account in the tablet application, this could be possible, but instead another voting system was implemented, where multiple votes for each song could be given, but there would be a timer countdown after each vote, disabling voting for a short period of time. The goal was both to set a limit on total votes and furthermore to avoid a use, where one person would keep voting for a single song, giving an unfair advantage.

Even though the tablet and mobile applications are aimed at different individuals, there was no reason to change the overall visual expression from the mobile application which, despite some resizing, is kept intact. This helps users, who have seen other people use the mobile application or tried it on another persons mobile device, to use the tablet afterwards.

5
Test Setup

Three field tests were carried out to explore the use of MEET in realistic setups. The choice of having three tests made it possible to observe the use of the system in both different social contexts and different physical locations.The tests were not carried out to find usability issues, however, comments from participants upon this aspect were noted.

- The first test location was a Friday bar in an apartment complex where a birthday party was held. The bar normally uses a computer connected to a stereo to play music. The computer itself does not hold any music and online streaming service, Grooveshark, is almost exclusively used. Because the music setup is situated behind the bar, the bartenders also act as DJs.
- The second test location was a Friday bar at the Department of Computer Science. Music is usually played from a laptop, connected to a stereo, that is accessible to anyone. YouTube and Grooveshark are however often used to find songs not present in the music library of the connected laptop.
- In the first two tests we brought the system to already arranged social gatherings, whereas we arranged the third social event explicitly with the purpose of testing the system. It was held in a private apartment, where the host usually uses a computer with iTunes as the main music player, but YouTube and Grooveshark are used as a supplement.

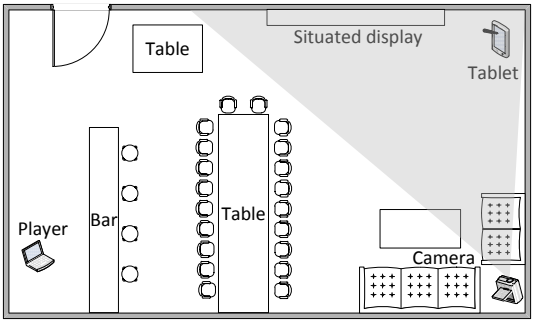
Although the system supports streaming over the Internet we made the decision to run the system on a local network, meaning that all the people who brought their own computer with a music library had to log on to this network. The network decision was made as a precaution in case of the system breaking down during the test. Having all connected home libraries close by, made it easy to manage a problem related to a library. The mobile application was released on Android Market, and the desktop application could be downloaded from a public website, including an installation guide which can be seen in appendix A.

5.1 Test 1

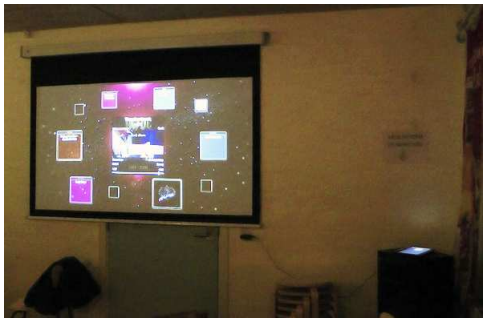
The music at test 1 was brought to the party by ourselves. None of the test persons brought their own computer with a music library in spite of the fact that they were invited to do so. One attendee brought some music on her iPhone, which we transferred to one of the music libraries connected to the player, which enables her to access her music through the system.

5.1.1 Setup

The Friday bar was equipped with a projector and a screen which was easily accessible and visible to the attending persons, and therefore made it suitable to use for the situated display. The player was placed behind the bar, because of the convenient access to the music center and furthermore, to avoid accidents with beverages. The tablet was placed in a corner close to the situated display. A stationary camera was set up in the opposite corner of the tablet having an angle of view enclosing the situated display and the tablet. The camera did not record the people attending by request from the bartenders and the person hosting the birthday party.
Figure 5.1(a) and 5.1(b) show a plan of the test location and a picture of the test setup, respectively.



(a) Plan of test setup for test 1



(b) Picture of test setup for test 1

Figure 5.1: Plan and picture of test setup for test 1.

5.1.2 User Group

The age range was 20-27 and attendees was the bar's normal guests, the guy who was having the 25th birthday and his guests. The number of visitors in the bar varied during the evening, but after the guests for the birthday party had arrived, it was constantly around 25. The participants of the Friday bar were from different educational institutions in Aalborg which made the IT competences of the attendees diverse.

5.1.3 Data Gathering

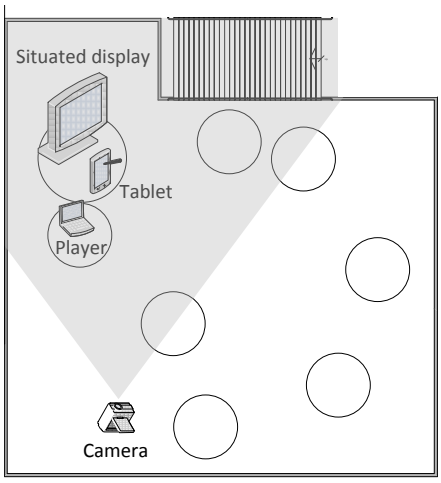
As seen in figure 5.1(a), the stationary camera recordings did not include the people attending the party and hence not their interaction with their mobile devices. The data concerning the use of and interaction with the mobile device was hence collected via observations, semi-structured interviews and log data.

5.2 Test 2

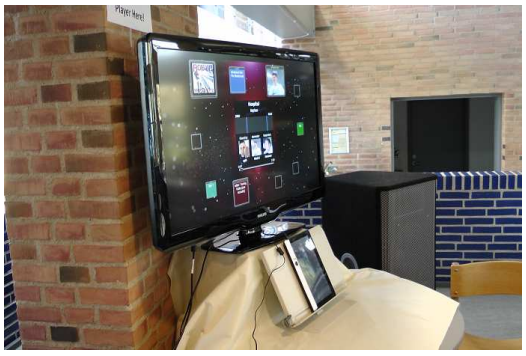
For test 2 we had modified the system in different ways. To obtain a higher level of identity management for people using the system, we introduced profile pictures for all users with a connected mobile phone. When voting for a song the user is added to a group of supporters that is displayed if the song is played. Likewise, when nominating a song, the profile picture of the nominator is displayed if the song is played. A point of criticism in test 1 was the browse function in the system, which was too slow and cumbersome. To comply with the wishes of easier and faster browsing we made a small modification in the browse function before the test.
For test 2, test persons volunteered to bring and set up their computers with the desktop application. The music at this test was therefore a compilation of the test persons' home libraries placed in different locations in the building.

5.2.1 Setup

The test was set up in the room where the Friday bar at Department of Computer Science is normally held. At this location the situated display was a 42" flatscreen on top of a box on a table. The tablet was placed in front of the flatscreen in an upright stand, to emphasize the connection between the situated display and the tablet, which was not obvious with the tablet position at test 1. The player was placed next to the situated display to ease the access of connecting the mobile devices to the system. The stationary camera was placed away from the system setup to have a view enclosing the player, the tablet and the situated display. This position made it easy to observe the interaction between the tablet and the situated display.Figure 5.2(a) and 5.2(b) show a plan of the test location and a picture of the test setup, respectively.



(a) Plan of test setup for test 2



(b) Picture of test setup for test 2

Figure 5.2: Plan and picture of test setup for test 2.

5.2.2 User Group

The majority of visitors at this bar were students and employees at the Department of Computer Science. There were, furthermore, five guests from University College, Aalborg, studying financial management, who visited the bar with the purpose of testing the system. The number of visitors was around 25 persons with an age distribution from 20 to 40. The system was tested predominately by people with a high level of IT competences and knowledge about system development.

5.2.3 Data Gathering

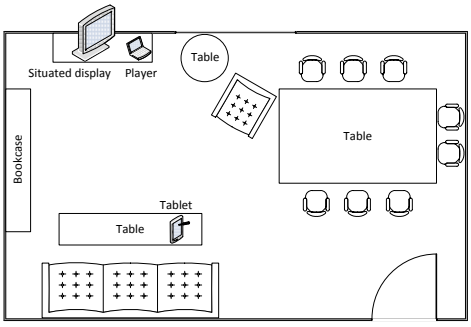
The data gathered at this test was done by video recordings, pictures, log data, observations and semi-structured interviews. The semi-structured interviews were recorded, both by camera and notes.

5.3 Test 3

For this test the guests were once again invited to bring their own laptop with a MEET home library, however only a few did so. Because of this the music available consisted mostly of our own music. The system was not modified between test 2 and test 3 since the two tests were carried out on two successive days which excluded the possibility of changes to the implementation.

5.3.1 Setup

The setup for this test was again based on the existing arrangement of the furniture. The existing 42" flatscreen was used for the situated display and the tablet was initially placed on the TV table in front of the flatscreen together with the player. This way the system components, except the mobile devices, were gathered in one place creating an interaction space surrounding the situated display. Since it was a small private party and the atmosphere was less formal than at the two larger social events, the tablet was quickly removed from its initial placement. Most of the evening, people without an Android phone took turn keeping the tablet at their disposal. Figure 5.3(a) and 5.3(b) show the plan of the location and a picture of the test setup, respectively.



(a) Plan of test setup for test 3

(b) Picture of test setup for test 3

Figure 5.3: Plan and picture of test setup for test 1.

5.3.2 User Group

The attendees at this test were ourselves and our friends who had shown interest in testing the system. The number of participants was 13, with an age distribution from 19 to 29. The test persons were students and former students at the Department of Computer Science, a lawyer, a pedagogue, a psychologist and two from University College in Aalborg.

5.3.3 Data Gathering

The data gathered at this test was mostly based on observations and pictures of the system use. As in the other tests the player logged the usage data. We left out the camera recordings to meet the attendees wishes of anonymity. Furthermore, we left out the semi-structured interviews to be able to participate in the test on equal terms as the others guests.

6
Test Results

This chapter describes the results gained from the three field tests described in chapter 5. Based on the research questions, four areas of interest are defined:

- The *Musical Influence* through the control of the system.
- *Identity Expression and Impression* through the system.
- *Social Interaction* during the use of the system.
- The system functionality revolving around *Multi-device Interaction*.

The findings and tendencies found during the tests were analyzed according to the data analysis methods described in section 3.3. They were further divided into one of the four groups, examined and supported by quotes from interviews with the test persons and statistics drawn from the gathered log data.

6.1 Musical Influence

During the design process, a set of standard rules were developed and incorporated into the player. To understand how these rules were received, it is important to look at how the test participants were used to control music in similar situations. As mentioned in chapter 5 the usual means of playing music at the test locations typically included a computer connected to a stereo and either using the music present on this computer through, e.g., iTunes, or streaming services like YouTube or Grooveshark. The interviews showed that these types of music systems were very common at private parties as well.

> *P1: "Often it's... It's just a computer."*
> *P2: "Yes, it's always computers."*
>
> *P3: "YouTube"*
> *P4: "Yes, and Grooveshark as well"*

What these systems have in common is a very direct form of control, centralized at a single interaction device. There is often a playlist functionality, but no built-in restrictions concerning control which means that only the unwritten rules of the social group applies. A user commented about MEET:

> *"Nobody can suddenly come up and click and then the whole playlist is gone."*

During the tests several interviewees expressed annoyance with the fact that people would often overrule each other's music choices, and liked the idea of preventing people from changing songs frequently and ignoring the playlist.

6.1.1 Distribution of Control

The distributed control is one of the characteristic features of MEET and is conceptually similar to that of O'Hara et al's Jukola [12]. Also similar to what they experienced during their study, we found that an important aspect, for the user, is to feel involved in the process of music choice. Several participants expressed a satisfaction with the fact that they were able to obtain musical influence, even though they were given an indirect control compared to what they were used to:

> *"Now, we don't know these people very well so... So we can just sit and vote at the party. Then we don't have to go up and discuss the music."*

> *"Well, as long as it's democratic you can just choose what you feel like listening to and then the others can vote it up or down."*

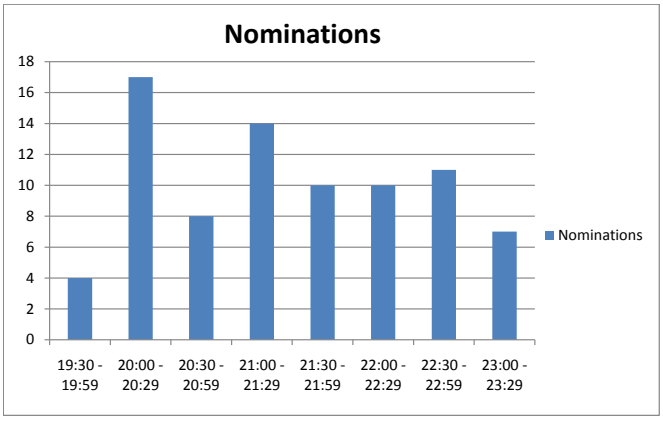
> *"That's also what's cool. You're not... You're not liable for your... for one person choosing a song while 39 other people don't like it."*

However, an experience made during the first test was that browsing for songs to nominate could be quite time demanding. One person expressed that you would have to invest a great deal of time to obtain an actual influence on the music, besides just voting for what was already present. The browsing process was improved prior to test 2 and 3 but it was still an issue that was mentioned during both these tests:

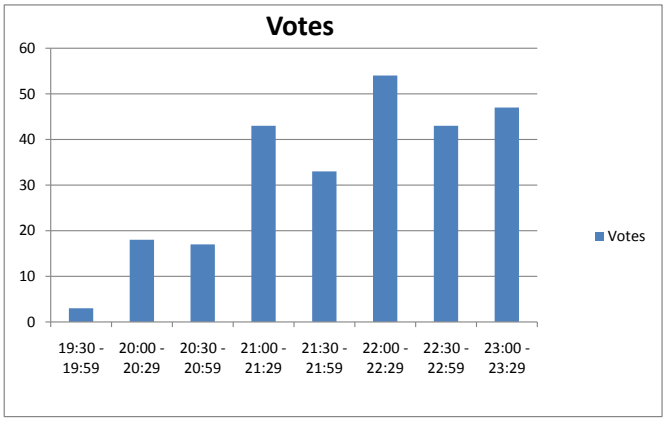
> *"Don't know why you don't just have it all under one [page] with a scroll bar at the right side. Then you don't have to go back all the time, you can just scroll up or down."*

The most repeated comment by participants was that the nomination process of browsing for songs was too cumbersome, and they requested a search functionality. The browsing functionality in itself can be made less cumbersome even though browsing large data sets is time consuming by nature. The nomination process as a whole can be optimized considerably by implementing the requested search functionality.
The system makes it possible to browse and nominate music from the user's own mobile phone without breaking away from the social context. Other systems are often controlled from a central point, which forces the users to walk away from their table to control the music system. Browsing while sitting at the tables sometimes also made the process a group activity.
Through interviews and observation we found that the amount of nominations declined throughout a party while the amount of votes inclined. This seemed to be caused by the cumbersome nomination process where participants at the beginning of the party wanted to be the ones nominating "the winner" but later settled for voting for or against the automatic nominations made by the player.

It is much faster to cast votes, with a single tap, than to browse through the player library to find a song to nominate. After the novelty of the system wore off, and due to the party changing character, participants prioritized socializing over interacting with the system, such that the social interaction became primary and the system secondary. Having used the system for a couple of hours, we observed that the participants mostly checked the situated display when they heard a song ending and a new song started playing. They then cast their votes on new nominations, all the while continuing their conversations. At that point in the parties, there was little time to concentrate on browsing through and nominating songs. Regarding this matter the log shows the same tendency, however, not to the same extent as the interviewees expressed. The diagrams for the voting and nominating activity, through test 1, is show in figure 6.1.



(a) Nominations over time.



(b) Votes over time.

Figure 6.1: Diagrams showing the nomination and voting activity during test 1.

The reason why the observations pointed to a decreasing nomination activity during the tests, could be the fact that the nominations were often connected to competition, which were most obvious in the initial phase of the tests. The logs show that some people kept on nominating throughout the tests, however, presumably in a subtle manner.
The observed behavior suggests that it plays an important role, that the time needed to perform tasks, like finding specific songs, is not significantly longer than the users are used to in other systems. Especially since the effort used on finding a song does not ensure that the song gets played.

The mobile phone has in general become a personal possession on the same level as wallet and keys. Therefore, an advantage of using the participants own phones as a control device is that they are intimately familiar with the device which require them to concentrate only on the application itself and not the device it is running on. Observations of the usage of the MEET tablet confirms that some participants felt uncertain when approaching the device and initially spent time getting comfortable with it, e.g., figuring out where the "Back" button was.
Compared to an exclusively external system, e.g., a jukebox, having downloaded and installed an application on a user's own device, the user acquires the sense of ownership. This potentially induces increased usage as users have power over the system through their own control device compared to getting in line in order to interact with a jukebox.

6.1.2 Player Rules

A conceptually important rule built into MEET is that songs are never interrupted. People in all tests expressed satisfaction with the fact that winning nominations were allowed to play until the end:

> *"There is nothing more annoying than listening to 20 seconds of some song then 20 seconds of a new song, you know. Even if it's a bad song that you don't want to listen to, you'll survive those three minutes. You know, if you haven't cast a vote, it's your own fault."*

One did however mention that although he liked the concept, he also liked that he could normally change the music spontaneously if a specific song just came to mind. This could suggest that such behavior is present and could suggest that some people prefer to maintain the direct control seen in other music players.

> *"I like the thing about, even though it's a little annoying when you are at a party, but the thing about suddenly wanting to listen to a song and then just walk up and...* ¡indicates typing on a keyboard¿"

Some rules were less obvious to the user than others, such as the elimination rules of the system. These remove nominations without any explicit feedback on the situated display. Both from single comments and during interviews, people gave the impression that they were able to understand the system as a whole and use it properly.

> *"When you have used it a little it's pretty easy. There are no crazy advanced things you have to do."*

However, the fact that very few commented on their songs not being played, either suggests that the majority eventually figured out exactly what happened or that the specific workings of the control was not the primary concern, as long as the user maintained a feeling of being part of the selection process.

6.1.3 Representation Modes

A unique design feature built on top of the control mechanism, is the random representations of nominated songs. Although people would comment that it was an interesting feature, it did create confusion at the beginning of each test, as described further in section 6.2. Reoccurring comments furthermore suggested that users would tend to vote for recognizable items both when casting positive and negative votes. For research purposes it was interesting to try a different, more playful approach to music representation, but in practice it brought more confusion than excitement to the table. This suggests that users preferred to base their music choices on direct comparison of recognizable nominations, rather than having unknown factors effect the results. Replacing the random representation system with a recognizable representation, would also contribute to the goal of making the system secondary.

6.1.4 Strategies

People would often use a varying amount of time after installing the mobile application, to figure out how the system worked either by themselves or by discussing it with friends. Voting did however seem to be the feature that was easiest for users to understand. As soon as people got comfortable with the concept and rules of the system, certain strategies evolved which could enhance one user's chance of getting a song played.

One strategy that was most significant at the first and third test, was simply to point out which songs other participants should vote for or against. This strategy is strongly related to the social communities explained in section 6.4 and especially people who knew each other well beforehand, used this.

A strategy that we were aware of before the tests, was simply to vote for a single song that you would like to hear and then vote against all other songs. Likewise you could vote against one song that you really did not want to hear and vote for any other song. This strategy was first mentioned to us at the third test, but log data shows that a few users would also make use of this strategy a couple of times during the second test. One user at the third test explained that one gets a great advantage, especially in a group, if other groups did not make use of this strategy. A user at the first test did however express a more straight forward approach, where they would just vote for the songs they recognized and would like to hear, vote against the songs they recognized but did not want to hear and leave the others in the neutral position. A pattern that seemed to be quite representative, at least for the first two tests.

The purpose of the tablet was to enable users without an Android phone to participate in the music selection process. In each test it did however end up being just as much a strategic tool for people already using their phone. In some cases people would nominate a song, vote for it and then walk up to the tablet to cast additional votes. In the third test, the tablet was not as stationary as in the other tests and it would sometimes be used by a single person for a longer period of time. This would give either the single person or the group that the person was sitting with, an advantage as they could sit in the group talking and then occasionally cast votes. People would also do that in the tests where the tablet was stationary, but because they would have to move up to the tablet and thereby expose themselves to the crowd, they would not use it for the same amount of time. People at a party furthermore do not want to separate themselves from the social context or frequently walk to and from the tablet.

6.2 Multi-device Interaction

During the tests, we found that the multi-device nature of MEET introduced some different interaction issues. Especially the response time,user feedback on the mobile and situated display and the placement of the tablet, gave some interesting findings.

6.2.1 Test Setup

The three tests had different physical test setups which influenced the use of the system. The choices for the setups were made according to what was possible in the physical surroundings, the requests of the participants but also on the basis of experiences from the previous tests.

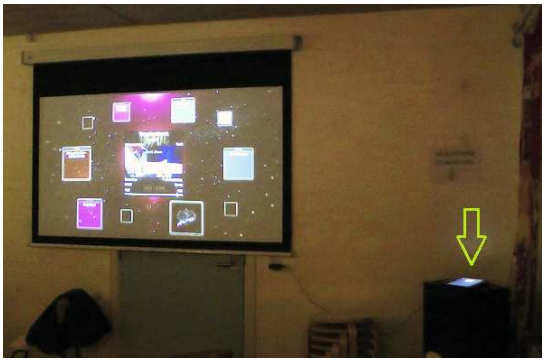


Figure 6.2: Picture of the test setup at test 1, showing the situated display and the tablet.

In test 1 we placed the tablet close to the situated display, hoping that the interaction between the two devices would seem natural to the users. The setup can be seen in figure 6.2. The tablet, highlighted with an arrow, however, was placed in a corner such that the user was facing the wall instead of the situated display. This physical setup resulted in confusion, since the effects of the tablet

actions were not clear to the user. One person who used the tablet during the test found that the nominations on the situated display did not always change size when he voted. It was not obvious to the user how his votes affected the nominations, simply because he could not keep an eye on the situated display when interacting with the tablet. The concept of the nominations getting bigger or smaller was not always clear with this test setup.
In test 2 we rearranged the test setup by placing the tablet directly in front of the situated display, making it easier to see the effects of having voted or nominated. It turned out that this setup resulted in much more activity around the tablet, due to increased visibility to the attendees than in the first test. We observed that placing the tablet in an open position like this also invited to social interaction around it. When the tablet was in use, people around it would comment on the choices made by the person voting or nominating, and sometimes another person would hurry up voting against the nomination the previous person had voted for, to make sure that this song was not played.
Test 3 was different from the first two tests since the number of attendees was lower. The people who did not have an Android smartphone used the tablet the most, but during the evening it would also be used as a trump. People would use it to vote several times on the same song to ensure either that it was played or not played. The main users were a couple mostly sitting in the sofa who at times collaborated on both nominating and voting but at other times used the tablet individually. They almost exclusively used the tablet as one would use the mobile application, not voting multiple times on any particular songs but rather voted a song for or against, waited the mandatory 10 seconds and voted for or against the next song. Other users, mainly from the group sitting at the dining table, used the tablet to participate in the group competition by voting multiple times on the songs promoted by the group.
The different physical setups in the three tests turned out to have an influence on the use of the system, especially on the use of the tablet. A large percentage of the attendees at all three tests had Android smartphones but the persons who did not, used the tablet to great extent. Making the tablet visible by having it in front of the situated display as well as circulating among the guests greatly increased the use of it.

6.2.2 Interaction Design

MEET builds on the concept of having the users controlling the system from different devices in the room. Having several interaction points introduces some interesting challenges for the user interaction in the system. In all three tests we saw a relatively low learning curve on using the functionality of nominating and voting from the mobile devices. People already familiar with the system often introduced it to newly arrived, so it was quickly spread how the system should be used. However, the functionality of the situated display was not as clear to the users as we hoped it would be. The final implementation worked such that when the mobile sent a vote request to the player, the mobile application user interface was not updated until the player had registered the call, updated the situated display and sent a response. The user waited for the mobile interface to change before looking at the situated display which resulted in the user not seeing the effect of his actions. This problem was consistent through all three tests, but as described in section 6.2.1, the problem was more severe during test

1 because of an unsuitable placement of the tablet.
Working with multiple devices we found that it is very important to be aware of how the feedback to the user is applied across different devices, to give the users a natural understanding of the effect of his actions. One issue is how the response time between the devices should be. In many systems it is crucial that the user gets a response as soon as possible, while in multi-device systems, it has to be coordinated to create a clear picture of the system concept. Another aspect is caused by the multi-user nature of the system. Because there is no explicit feedback per user, it is not always clear what feedback on the situated display is caused by which specific user's actions. This effect is further enhanced by the issue mentioned before.
Through general observations we found that people were confused about the mapping when nominating a song and it appeared on the situated display as one of the random representation modes. This was substantiated by one of the interviewed participants:

> *"It's both a bit cool and a bit weird. In some way I actually like it because you aren't quite sure of what you're voting on but some times it's also just a little weird... Especially when you nominate something, it can be hard to tell if it actually made it up there."*

When the user browses through the player library and finds a song to nominate, he expects that what appearance of the situated display to be equal to what he has just nominated, instead of, e.g., a questionmark, a genre or a profile picture.
It is worth to consider how much the system should be a music player or a music playing game. Including the game element makes the system more intrusive and forces the user to make decisions based on incomplete information. If instead all nominations are represented with full information, the user can quickly decide what he likes and dislikes and will not be surprised. This effectively makes the system more of a music playing tool than entertainment in itself and therefore becomes secondary to the party.
In test 1, two users who were using the system together expressed that they primarily voted on the nominations where they could see the total info, meaning title and artist. The representation modes which were unclear were unimportant to them and they therefore did not care to vote for them. In general it seemed that the users preferred the recognizable representation modes where they were sure what they voted for.
Another user group commented that the nominations that were largest on the situated display were the ones they mostly voted for. If a song they did not want to hear was growing and was a potential winner they voted it down.

6.3 Identity Expression and Impression

When developing a system where people have simultaneous musical influence, we have tried to implement different functionalities to obtain some kind of identity expression among the participants. The fact that the users can control the system anonymously from a distance and do not need to interact with a centralized music player, makes it interesting to explore how we, in a direct way, can show who participates in making choices about the music. We have therefore given the users the opportunity to promote themselves in the system in three ways; bringing their own music, nominating music for playback, and voting for nominations. We have implemented functionality for profile names and profile pictures which the users chooses themselves and is displayed on the situated display when they have the roles of owner, nominator and supporter. When people interacted with the system, we wanted to see how they reacted when their names and pictures showed on the display and what it meant to them that they were personally exposed to the rest of the participants.

6.3.1 Bring your own Music

One of the main features in the system is letting people bring their own music. The system is designed to have two levels of music filtering, which means that the music, from the home library, can be dynamically filtered to fit specific situations. One thing that we wanted to examine was what it meant to people that they were able to bring their own music to a common music library instead of, e.g., finding it on YouTube. During test 2 and test 3, where people brought their own music, we saw that they actually made use of and thought about this filtering functionality:

> *"I chose some of the things that I think people will like... some of what I myself would like to listen to and some of what I believe people want to listen to."*

One person at test 2 commented that he had included his entire music library in his MEET home library, but when he had to pick out what music to share to the player at the party, he only chose what music he thought would be appreciated at the current party. His choice of music was therefore not based on his own favorite music but actually on what he believed people would like to listen to. A person at test 3 who had the same preferences when sharing music stated:

> *"It makes absolutely no difference bringing your own music if you are the only one who wants to listen to it. If others don't want to vote for your music then... there is no reason to bring it."*

Another person at test 2 had only shared one album, which was an album he listened to a lot. One of the first things he did from the mobile application was to nominate a song from this album. This person chose music from what he himself would like to hear instead of what he thought the other participants would like to hear.

During interviews with different people, we found that some liked having what could be called "musical safety", meaning they knew that they had access to some of the music they liked. One of the reasons for this was expressed as:

> *"It is nice that I can bring the music I like to hear in case of being some place where all others who brought music wanted to listen to death metal..."*

Looking into which systems people normally use when listening to music at parties, many of them mentioned iTunes or similar local music players, Grooveshark and YouTube. The former system only provides access to a single users music collection while the latter two systems give access to a wide range of music ensuring musical safety for everyone. Several users explained that during private parties they would start by using iTunes but later switch to either Grooveshark or YouTube because of the wish to listen to music not available in the local music library. This implies that the popularity of these systems is significantly rooted in musical safety. Enabling participants to metaphorically bring their own music to parties through MEET would significantly improve everyones musical safety and potentially eliminate the need for switching music systems. There can however be a difference in the music people owns and the music they would want to listen to at a specific event.

From the observations we found that there are different approaches on how to filter the music brought to the parties. Some of the participants chose the music that they thought would be appreciated, some chose what they would like to listen to while others mostly thought about musical safety.

6.3.2 Profile Name

At all three tests the system featured profile names which the users could change at all times during the test. We found that people had different ways of choosing their profile name. In test 1 we had some interesting observations concerning choice of profile name. One person had chosen to use his own name when initially configuring the mobile application. After a while he figured out that profile names were displayed on the situated display when nominating or voting, and he therefore changed his profile name to an alias name. Another person, who from the start knew that his profile name would be displayed on the big screen, told us that he had chosen an alias instead of his own name. These two persons did not want to be recognizable to the other participants and therefore chose aliases as profile names.
In test 1 we also observed that the profile names could be used for a whole group. The first group to arrive at the party only had one mobile phone running Android. The owner of the phone wanted to share the control from her phone and she therefore picked the profile name "Christina and the funky boys".
In general, we saw that the profile names were people's own names or nicknames they normally went by. Some people chose crazy names just for fun, because they knew the other people attending. However, during tests, we observed that the profile names were not a big object of attention. Even though all users had chosen a profile name, these made minimal impression on the other users. It seemed that people were focused on self-expression by choosing a good name

for their profile, but did not pay a lot of attention to others' profile names and sometimes not even their own when displayed.
The system was implemented such that it was possible to change the profile name during the use of the system. Our log data supports that after selecting a profile name the interest for this area faded. Few persons actually changed profile name during the tests. Most of the users primarily looked at the the profile pictures, the music information and how the nominations changed size when voting.

6.3.3 Profile Picture

From test 1 we found that the profile names were not as visibly significant as we hoped they would be and we therefore tried to give the system an extra factor of identity with the profile pictures. Before connecting to the player, the users had to take a profile picture, which would be shown on the situated display during the test. Most of the participants chose to take a picture of themselves, which was what we hoped for. What we observed during the tests was that the users found it entertaining when they appeared on the situated display. The following comment, about which profile picture a participant of test 2 chose, sums up the observations and interviews of the test participants quite well:

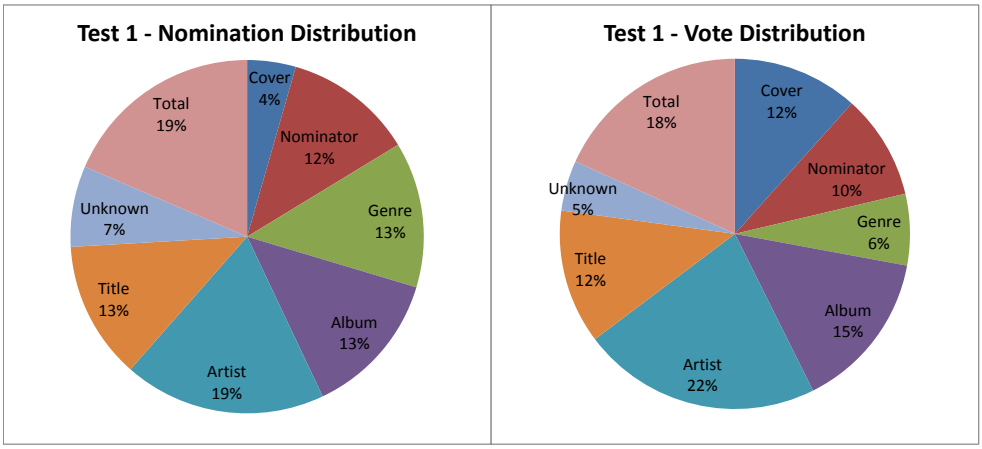
> *"It's the username I use all over the Internet. I'm pretty sure that no one here will recognize me unless they know me from somewhere else. But then I took a really good picture of myself which is really, really nice and that is shown on the display all the time because apparently my music is all people want to listen to."*

Common for the users was that if they did not know a lot of the people at the party they would choose a "normal" picture, while several of the participants expressed that in a circle of only friends they would probably choose a more "fun" picture. Having the profile pictures displayed on the situated display gave rise to some interesting observations about identity expression and impression:

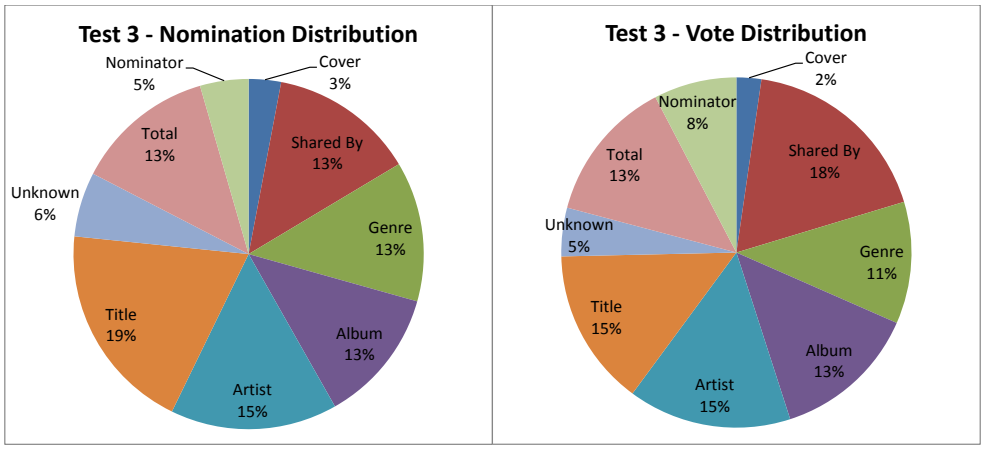
> *"It's really strange how many people are voting for me because I don't think many people know me but they just vote for my picture because it's an awesome picture."*

It was clear that the pictures meant a lot to the use of the system and were often a subject of conversation. Especially, when one person's picture came up three times during one song as the owner, nominator and supporter, many people, including the person himself, would notice it and comment positively on it. Furthermore, the participants also commented on if people had a funny or a cool picture. Having a cool picture and having the picture shown many times seemed to be a kind of status symbol, which gave further reason to interact with the system.

The logs confirm increased attention to the identity after the profile picture was added. Figure 6.3 shows how people would be more inclined to vote for either nominations represented as "Nominator" or "Shared by", showing pictures instead of just a profile name. Notice that test 1 only had the nominator representation mode whereas test 3 both had nominator and shared by. Test 2 also showed an increased attention to identity, but it was with the more intimate user group at test 3, where it was noticeable on the vote distribution.



(a) Test 1



(b) Test 3

Figure 6.3: Distributions of votes and nominations for test 1 and test 3.

During the tests some users called to attention that they would come up as supporter for a song they had given a negative vote. This bug gave rise to an interesting observation on people's identity expression. People reacted strongly on this bug because the system said something wrong about them. Having their picture shown in relation to a song they liked was positive, but if their picture was shown in relation to a song they disliked they were very expressive about not wanting to be associated with it. This indicates a clear connection between

music taste and identity, and about how music taste is an influential factor on how people appear and how they want to appear to others.
The connection between a person's identity and their taste in music was not only apparent when people wanted to express their own identity. It was also used the other way around. As accurately expressed by a test participant:

> *"I think it's really cool that you can see that 'Shared by' thing and then just vote for that... That's something to do with, if you know the person then you know their taste in music."*

When a person has opted to share a song and the song is visualized under the "Shared by" representation mode, the participants who know that person have an understanding of the kind of music that person would share. They can therefore relatively safely vote for, or against, the song according to their own taste. On the other hand, if other participants do not know the owner of the song, they get a glimpse of that person's taste in music and by extension their personality:

> *"It also provides an insight into the tastes in music of the people present instead of just having a collection of one person's music."*

This corresponds to what was observed during the parties where participants commented as the player started playing new songs. The comments originated both from the person sharing the song and participants noticing the new profile pictures shown on the situated display. The owners typically proudly pointed out that the song was theirs while the participants either gave positive or negative comments about the taste of the owner, the latter exclusively observed as meant in good nature.

6.4 Social Interaction

Because the control is distributed to individuals there is a risk that it would inhibit social interaction. During the three tests we encountered that even though many of the participants had their own Android mobile devices, the system still gave rise to different forms of social interaction. Especially competition and different kinds of game playing were observed.

6.4.1 Community

Having the nominations on a public display quickly gave people a feeling of the different music tastes present at the party. A person from test 1 stated:

> *"The music taste is very mixed here. It's both hardcore rock and Medina-like."*

This conclusion was drawn exclusively from what she could see on the situated display and not because she knew the people. Having similar music taste resulted in people grouping and obtaining a sense of solidarity with each other. Another way in which people obtained a form of community was by gathering around the present mobile phones. As described in section 6.3.2, one person in

test 1 actually created her profile name from the group which she was a part of because she was the only one with a smartphone. Much discussion went on around the table she was sitting at, in order for them to agree on which songs to choose. Most of the music chosen was pop and since they were very active in both nominating and voting, this led to voting battles versus another group mainly focused on hard rock. The latter group had the advantage of owning several Android phones and therefore had more votes. They did however only use their advantage to counter vote songs they did not like which shows two different uses of the system by groups.

6.4.2 Competition and Game Playing

During all three tests we observed competitive behavior mainly originated from groups formed on the basis of similar taste in music. We observed that the groups helped each other internally, voting for the music which they agreed on and at the same time trying to avoid that the other groups' music was played. In test 1 and 2 this tendency was not as clear as in test 3.
From the interviews in test 1 it was clear that the participants were divided. As written in section 6.4.1 the division was clearly based on similar taste in music. In test 2, groupings were mostly based on people joining the party together or knowing each other well. However, at one point we observed that a person nominated a song which he actually thought was quite annoying:

> *"The 'Friday' song? That was just because it's the worlds worst song and it was really funny."*

He arranged with the people by his table that they should try to make this song win, just to tease the other participants. Another table found out about their intentions and agreed on voting the song down. The first group started to use the tablet to get extra votes for a nomination, and finally it won with following good natured booing from the other table. This competition was clearly a fun activity where both groups enjoyed the fight about which song should end up winning.
Test 3 was the test where the groupings were most obvious. The sofa arrangement and the dining table of the test location physically split the participants into two groups. We experienced that even though the groups did not share the exact same taste in music they got a sense of solidarity with their group and helped each other out voting for their individual nominations. We even observed that the two groups bullied each other in a friendly manner, e.g., making sure that the songs the other group disliked the most were played next.

A big difference was observed between the process of nomination and the process of voting in regards to the "fun factor". Voting was generally considered entertaining and even fun, while nominating a song was considered more of a chore. When commenting on the voting process, participants emphasized animation and intuitive graphical mapping between the devices as the most important elements, while for the nomination process, ease of use and speed of task completion where prioritized. This shows that some parts of the system are focused on user experience while others on usability.
A testament to the fun factor of the voting process, besides the comments from the interviews and general observations, was a 27 year old woman attending test

3 who recently finished a master's degree in psychology. She is a self-proclaimed "anti-technologist" and does not own a smartphone. Her boyfriend, who also attended the party, owns an iPhone which she has never gotten comfortable using. MEET, on the other hand, was no problem for her. She quickly took over one of our own Android phones and kept it all night, regularly keeping an eye on the situated display for new nominations while having the phone on the table in front of her, ready for action. She positively commented on making a technology product she actually enjoyed using. She engaged independently in the battles between the soft pop and the hard rock groups, both through voting and through loud comments to both sides. Getting the phone back required us to end the test.

7 Discussion

The development and test of MEET has led to a number of interesting findings. We have looked into some of the relevant topics found through earlier HCI studies in the area of music, and tried to develop a new and innovative music system while still focusing on the basic properties important for music sharing and listening.

Musical Influence

Whether the control method in MEET is more suitable for social events than that of conventional players is hard to determine. People did however enjoy that songs were not interrupted, while still having influence on what music was played. The only direct interaction was with mobile phones or a tablet, but the centralized situated display turned out to create a common interaction space which led to game playing and competition.

MEET benefits from a pre-existing familiarity with the control device, by using people's own mobile phones. Users of MEET only had to learn how to use the application and not the device itself.

In order to keep the system secondary to the social interaction, we found that the effort of finding a song must not be greater than the systems users currently use. During the tests, it was expressed that the browsing functionality of MEET was too cumbersome and time-demanding which led to a tendency of decreasing browsing activity during the parties. As a result of the browsing difficulties, the users requested a search functionality and a functionality to browse through specific users' music, which would ease the browsing and nominating process. While the parties, during the evening, changed character to be more focused on the social interaction than the system, users would still vote to influence the music being played.

In the design process, the random representation modes on the situated display was thought of as a fun feature which should contribute to an extra level of excitement during music control. The test results showed that the random representation modes were an unnecessary extra feature, since people primarily voted for nominations displaying recognizable information. Another point of criticism related to the situated display and the random representation modes,

was the mapping between the mobile and the situated display. When nominating a song, the users were uncertain whether the song was correctly nominated if the song would appear as, e.g., a questionmark on the situated display. They expected the same information as could be seen on the mobile at the time of nomination. Removing the unclear representation modes such as questionmark and genre would be preferable.

The concept of the leading songs being the largest, was new to the users and was therefore often a subject of conversation at the beginning of the tests. Through social interaction and simply trying out the system, the users generally figured out the concept and learned it well enough to develop strategies and participate in competitions. The tests showed that the users mainly focused on the largest items which lead to much competitions around these. Since the largest items are the most important candidates for future playback, this makes sense, and created clear competitors for the users to vote for or against. This also helped in keeping the system secondary, as the users would periodically check the situated display for the largest items and vote for a couple of them while continuing their social interaction.

Multi-device Interaction

A finding concerning multi-device interaction was an issue with the voting functionality. Users voting for songs would tap a song in the voting screen, on the mobile phone, wait for the screen to reflect the action and then check the situated display for the result. This is not unreasonable behavior but the voting screen, would not update until the situated display was done updating. The users would not notice the update happening on the situated display as they would not shift their attention away from the mobile phone until it was done updating. Several users expressed disbelief in that their vote had been correctly cast until urged to look at the situated display before tapping the voting screen, similarly to when using a remote control. They would then see the nomination list update according to the vote, look back down at the voting screen and see the update there as well.
Since the mobile application does not work as a conventional remote control, it give some kind of visual feedback.It could be considered implementing a delay such that the situated display is first updated after the user gets a response on the mobile display. Another solution could be to prolong the animation feedback on the situated display giving ample time for the user to catch both system updates. In this way we accommodate the natural user response of first interacting with the mobile and then looking for the effect on the situated display.

The sequence of updates between the devices could be made more evident to the users. This could be done by either instantly updating the voting screen on the mobile device, even if the casting of the vote had not yet been completed, or prolonging the animation on the situated display. If, e.g., the song that a user voted for slowly expanded, on the situated display, while clearly marked by a glowing border, the users would have a chance to notice the change.

Since the tablet was meant as an interaction device for users not owning an Android smartphone, an additional change should have been made to the tablet application compared to the mobile application. Though it was safe to assume that owners of Android phones knew certain conventions used by the operating system, this was not the case concerning the tablet. Every Android device has a physical "Back" button with functionality similar to that of the "Back" button in Internet browsers. As was the case in the mobile application, the button was used on the tablet but this was not an obvious functionality for users not familiar with Android. The functionality of the "Back" button should have been implemented as a graphical button always available on-screen. With the additional screen space of the tablet compared to a mobile phone, this would not be an intrusive alteration of the design of the application and would have limited initial confusion when new users tried the tablet for the first time.

The use of the tablet was, however, not limited to users not owning an Android device. It was often used as part of voting strategies both by individuals and by groups. This was the case in all three tests and validates the decision to add a 10 second delay between every vote in the tablet application. Had the users been able to vote indefinitely on a single song from the tablet, this would have undermined the voting scheme completely.

Identity Expression and Impression

Studies, mentioned in the chapter regarding related work, prove that identity expression through music is a very important aspect to the activity of music sharing and listening. Additionally, naming of music collections and profiles are thoroughly considered by users to express themselves like they see themselves, how they want to be seen by others or to be recognizable in a social context [5], [7] and [8]. All the users chose a profile name when installing the mobile application and connecting to the player. The profile names were typically personal and chosen from either the users' own name or nickname, but some chose an alias because they did not want to be recognized. One group sharing a single phone, identified themselves by the single profile name"Christina and the funky boys". These findings show examples of how the participants managed their identity expression which was a general tendency throughout all the tests.
Despite of the participants' engagement in choosing a suitable profile name, it turned out many users did not notice other users' names on the situated display. This indicates a big difference in identity expression versus identity impression, regarding profile names.
To increase the focus on musical identity, profile pictures were added to the system. These pictures were shown in connection with the owner, nominator and supporter roles displayed on the situated display.
Multiple consecutive appearances of a picture and the same picture shown in all three roles on the situated display, drew much attention and, in turn, contributed to a great deal of discussion between users. The owners of the pictures showed pride in successfully having expressed themselves and observers voiced their impressions about the pictures. The latter observation corroborate the findings of [5].

If a conspicuous picture was shown on the situated display this prompted discussion and general positive impressions by observers. This was caused by recognizing the effort put into creating a distinctive profile picture.
Another observation was caused by a bug in the system, where users who had voted against a song would still be shown as supporters of the song on the situated display. Users would voice their dismay of being associated with a song they had specifically voted against, which is a clear case of the need for being in control of their identity management.
It turned out that the profile pictures were more successful in expressing identity and much more successful with identity impression than the profile name. A reason for this is partly because of the increase in design space for showing profiles but more likely due to pictures being much more expressive than pure text.

Another aspect of identity management was expressed through music selection from home libraries. A few users only selected the music they would like to listen to themselves, as a musical safety, ensuring that the player library would contain music they liked. However, most of the users who contributed with music, shared the music they thought would be appreciated by others at the current social event, to contribute to a fun evening.

Social Interaction

During the tests, different types of social interaction emerged. One of the goals of MEET was to support people expressing themselves through music sharing and listening in social contexts.
Comparing MEET with the similar system Jukola [12], there is a main difference in the design of music control that potentially influences the social interaction while interacting with the system. Jukola's shared control devices, placed centrally in plain view of everyone around a table, might result in the social interaction revolving around the system more than the people present. MEET is supposed to avoid such a tendency by being a music player that is fun to use, while staying secondary at a social event. The choice of using people's own devices as control points helped achieve the goal of favoring the social interaction over the music system itself.
The system turned out to encourage social interaction, even though most people sat with their own personal control device. We saw that people often found communities in groups of people sharing the same taste of music as themselves. In some cases groups were based on the physical surroundings, sitting together at a table, while in other cases people felt a connection with others in the room simply placed on the music that was played. This indicates that people had a clear perception of which types of people were present without knowing them. We furthermore saw that some groups were simply nominating and voting for an unpopular song, just to tease others.
Since not all participants had smartphones, people sometimes shared a phone for browsing, nominating and voting, which resulted in intimate groupings. The tablet also gave rise to social interaction, where people talked about what music to nominate and which nominations they should vote for in order to make their favorite music win.

Another form of social interaction was competitions which often took place between the groupings mentioned above. The competitions had the purpose of making a song win while making sure that other groups' music would not. These competitions were highly apparent evident by people teasing each other. The use of the tablet also triggered some competition. Sometimes if a person saw others interacting with the tablet and disagreed on the choices that were made, they would hurry up to cast a negative vote to prevent the song from being played.

The groupings and competitions would turn up occasionally during the parties, creating a balance between the system use and the social interactions regarding being together at a social event.

8 Conclusion

This master thesis describes the concept and development of the music system MEET. Through a technical analysis and a workshop, the system concept has been developed, and in an incremental process the system was implemented. Based on the system, three field tests were conducted and the collected data was analyzed and grouped into interesting categories.

Musical Influence, covers over the findings concerning the alternative control of the system. Pre-existing familiarity with the control device decreased the learning curve for the user. We found that obtaining musical influence should be effortless and finding songs to nominate should not be more time consuming than finding songs in conventional music systems. Furthermore, the representation modes turned out to be a unnecessary extra feature where the users would prefer a recognizable representation instead.

Multi-device Interaction, looks into the issues associated with a multi-device, multi-user system. The tablet was intended for people without an Android device, but it turned out that the common control device ended up being part of users' strategies rather than being a backup interaction device. A finding concerning multi-device interaction showed that coordination between the interaction device and a device providing feedback is crucial. The timing of performing an action and getting feedback on two separate devices must be adjusted to accommodate the fact that the user is unable to focus on several devices simultaneously.

Identity Expression and Impression, deals with the findings concerning how the system supports identity management through people bringing their own music to a common library, and how profile names and pictures expressed identity. Exposure through a profile picture on the situated display was much more effective in facilitating both identity expression and impression, than the profile name alone. Control of identity management proved to be essential to the users, emphasized by a bug showing profile information in connection with music conflicting with the music preference of the user.

Social Interaction, works with the findings concerning how the system invites to social interaction. These findings showed that the system led to groupings of people, competing with other groups. The groupings were based on the physical surroundings, music taste or sharing a single interaction device.

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Part I

Appendix

A

Test Documents

Flyer

Interaction Design Master's Thesis in Software Engineering

MEET is a music system, where people via a smartphone can provide access to music streamed from their own computer to a common playlist at a party. The system ensures that:

- everyone can participate in the control of the music played
- the music never stops
- every track will be played in its entirety
- there is no "jukebox-queue", where your request could be the 100th in line

Come and test MEET - this Friday the 29th of April in Foobar

Contact: f11d612a@cs.aau.dk

Figure A.1: Example of a flyer distributed around the university campus before field test 2 in one of the Friday bars.

MEET Mobile Application Barcode

Figure A.2: An example of the barcodes distributed within the test location during the tests, used to automatically download the MEET mobile application when scanned.

Introduction to MEET

Introduktion til MEET

Hvad er MEET:

MEET er et musikafspilnings system, hvor folk via en smartphone kan give adgang til at streame musik fra deres egen computer til en fælles playlist ved en fest. Kontrollen af afspilningen er delt ud til alle tilstedeværende ved festen. Systemet sørger for at:

- alle har indflydelse på hvad der bliver spillet ved festen
- musikken aldrig stopper
- der ikke bliver skiftet nummer efter hver 10. sekund
- man undgår den lange "jukebox-kø", hvor dit nummer kan være nr. 100 i køen

Praktisk information:

Vil du dele din musik skal du installere vores Biblioteksserver og udvælge den musik du vil have tilgængelig ved festen. Biblioteksserveren indeholder også afspilningsfunktion men denne er blevet slået fra i jeres version.

Vil du være med til at nominere musik til playlisten og stemme på nomineret musik, skal du installere vores mobilapplikation til Android. Med denne applikation kan du browse igennem den fælles playlist og herfra nominere ønskede numre, samt afgive din stemme.

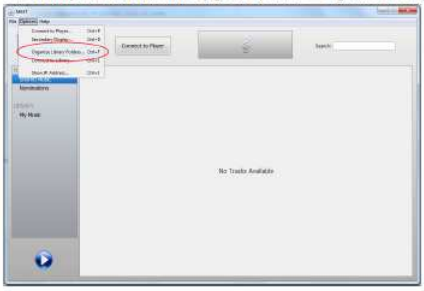
Har du *ikke* en Android telefon kan du stadig være med til at nominere og stemme ved at bruge den fælles Android Tablet som er stillet op ved festen.

De efterfølgende vejledninger forudsætter at både MEET Biblioteks server og MEET mobil applikation er installeret og **på samme netværk**.

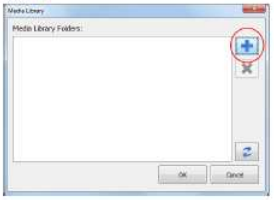
Figure A.3: Page 1 of the installation and setup guide available for download with the desktop application.

MEET Biblioteks server setup:

1. For at tilføje musik til dit library gå til *Options -> Organize Library Folders (Ctrl + F)*



2. Klik



3. Find mapper med MP3 filer og markér dem du vil tilføje. Klik herefter på *Add Folder*. Programmet gennemser alle undermapper og tilføjer fundne MP3 filer.

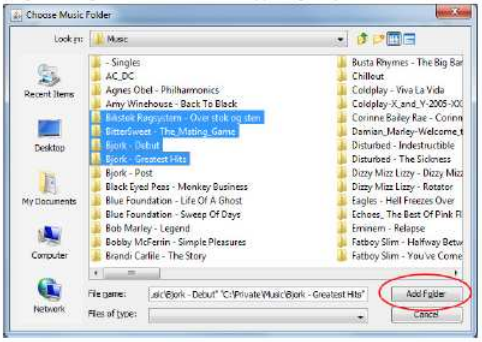
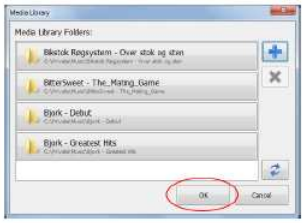


Figure A.4: Page 2 of the installation and setup guide available for download with the desktop application.

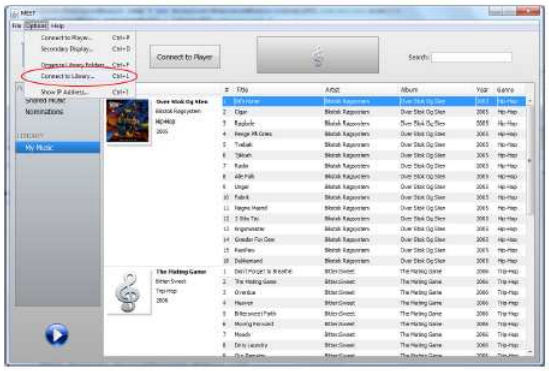
4. De valgte mapper er nu tilføjet til Media Library Folders. Tryk *OK* for at godkende dine valg.



Forbind til MEET Biblioteks server:

For at forbinde mobilen til dit bibliotek skal du:

1. I menu baren, gå til: *Options*
2. Vælg *Connect to Library... (Ctrl + L)*



3. En kode bliver genereret som du skal scanne med mobilen.

Figure A.5: Page 3 of the installation and setup guide available for download with the desktop application.

Scan med mobil:

For at scanne den generede kode fra dit bibliotek skal du:

1. I hovedmenuen, gå til: *Settings*

2. Vælg *Library Connection*

3. Vælg *Connect to Library*

Figure A.6: Page 4 of the installation and setup guide available for download with the desktop application.

4. Mobilen starter stregkode scanner og er nu klar til at scanne koden fra MEET Biblioteks server. Hold telefonen op så stregkoden er indenfor scannings feltet, indtil scanneren lukker af sig selv og du får beskeden "*Connected to: <computernavn>*"

NB! husk at scanne en ny kode hver gang din computer har skiftet netværk eller har fået en ny IP-adresse.

Del musik på MEET mobil applikation:

Når du er forbundet til din MEET Biblioteks server kan du browse igennem din musik og dele den på følgende:

1. I hovedmenuen, gå til: *Settings*

2. Vælg *Share Music*

Figure A.7: Page 5 of the installation and setup guide available for download with the desktop application.

3. Du kan nu browse igennem din musik og på sider med albums eller sange kan du swipe på den grønne pil for at dele albummet eller sangen.

Er du ikke forbundet til en afspiller gemmes dine valg og bliver delt næste gang du tilslutter en afspiller.

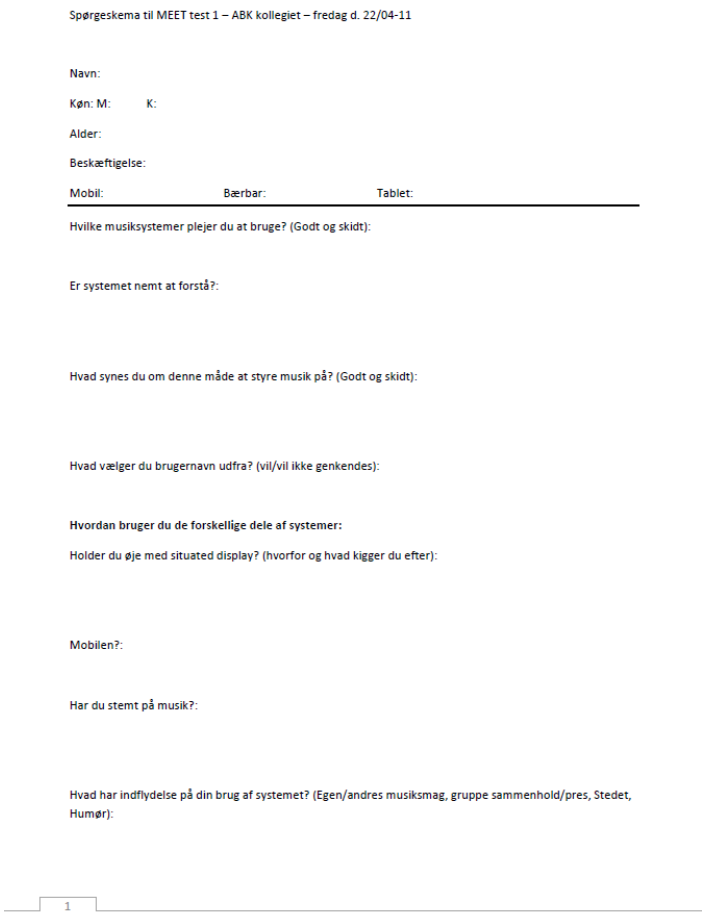
Har du spørgsmål til opsætningen er du velkommen til at skrive til os på mail:

f11d612a@cs.aau.dk

Figure A.8: Page 6 of the installation and setup guide available for download with the desktop application.

B

Interview Questions



Spørgeskema til MEET test 1 – ABK kollegiet – fredag d. 22/04-11

Navn:

Køn: M: K:

Alder:

Beskæftigelse:

Mobil: Bærbar: Tablet:

Hvilke musiksystemer plejer du at bruge? (Godt og skidt):

Er systemet nemt at forstå?:

Hvad synes du om denne måde at styre musik på? (Godt og skidt):

Hvad vælger du brugernavn udfra? (vil/vil ikke genkendes):

Hvordan bruger du de forskellige dele af systemer:

Holder du øje med situated display? (hvorfor og hvad kigger du efter):

Mobilen?:

Har du stemt på musik?:

Hvad har indflydelse på din brug af systemet? (Egen/andres musiksmag, gruppe sammenhold/pres, Stedet, Humør):

1

Figure B.1: The front of the interview question and note paper.

Spørgeskema til MEET test 1 – ABK kollegiet – fredag d. 22/04-11

Til folk med medbragte bærbare/biblioteker:

Dobbelt filtrering:

Hvad vælger du musik udfra (biblioteks niveau) – (kun til folk med bibliotek):

Hvad vælger du musik udfra (fest niveau):

Hvad betyder det for dig at du kan medbringe din egen musik?

2

Figure B.2: The back of the interview question and note paper.

C

Video Transcription

SD1 - Video - 00000.MTS

Generelt

- Situated diplay = Mere end 4 nomineringer = folk har selv nomineret
- Now Playing = sang delt af Liv, nomineret af Sren, stemt p af Jesper og Sren selv

Ib nominerer, Piepgras og Ib stemmer

- Start - 00:10
  - Ib nominerer ny sang, "Tv2 - Be bab a lu la", verste hjre hjrne p situated display, lurer lidt p. hvordan man gr men prver sig frem uden problemer.
- 00:11 - 00:18
  - Ib vil stemme, trykker Previous n gang for at komme tilbage til menuen.
- 00:19 - 00:25
  - Piepgras kommenterer: "G ind under og stemme".
  - Ib ser at der ikke sker det han gerne vil have.
  - Bruger nu, korrekt, Back-knappen indtil han er tilbage i Party-menuen og trykker Vote.
  - Piepgras kommenterer: "Srg for at Final ikke bliver stemt op".
- 00:26 - 00:29
  - Inden han nr at overskue situationen, voter Piepgras for ham p sang med Title "Rope".
  - Ikke den sang Ib nominerede.
- 00:30 - 00:44
  - Nedtlling starter og Ib venter pnt p sin tur.

  - Ib stemmer ogs p “Rope”.

- 00:45 - 00:53
  - Ib venter igen p at f lov til at stemme.
  - Kameraet svinger over p Peter.
  - Peter kommenterer p user interfacet.
- 00:54 - 02:02
  - Voting.
  - Vil gerne altid have vist artist/title s man ved prcis hvad man stemmer p.
  - Trykker frst p ikonerne af sangene i stedet for til hjre og venstre.
  - “Er det en sang eller et album man stemmer op?” nr en sang str i Album mode.
- 02:03 - 03:15
  - Fortstter uden tven ind i nomineringsmenuen under Artists.
  - “ved ikke hvorfor man ikke bare har det liggende det hele under en... with a scroll bar in the right side. Then you don’t have to go back all the time, you can just scroll up or down”.
  - Ellers kunne der i stedet for Previous/Next st hvorfra og til sidste/nste side gr.
  - Klikker sig uden tven ind til en sang, “Psycho Killer”, forsger at klikke for at nominere, tver lidt, og swiper til sidst korrekt sangen.
- 03:16 - 03:37
  - Vil tjekke hvilken sang han har nomineret, men kommer til at trykke p Home-knappen
  - Gr tilbage ind i app’en og bruger korrekt Back-knappen til partymenuen
  - Efterspørger en “Hovedmenu“-knap for oven i skrmene til at komme tilbage til Party-menuen. For mange klik for at komme tilbage. ¡Philip pointerer det samme til den Private fest¿
- 03:38 - 04:56
  - Klikker Vote fra partymenu
  - Nomineringen = Album mode
  - En nominering br automatisk blive stemt 1 op af nominator
  - Tyderligere indikering af +/- vote-muligheder, fx grn/rd farve
- 04:57 - slut
  - “Men det er ellers meget godt, det at man kan st og stemme musik og folk ikke skal til at skifte og... og s det har med at I har lagt det hele ud.”

- kender ikke et lignende system.
- “ideen er god“, “helt vildt godt til mange fester og sdan noget”.
- Fedt at “der ikke er nogen der lige pludselig kommer og trykker og s er hele playlisten vk”.
- Skal ikke begrnses til samme netvrk.

SD1 - Video - 00001.MTS

Interview med Henriks ftter og venner (5 mnd - nummeret fra P1-P5 med uret startende fra Henrik)

- Start - 00:17
  - Alder 19-26
- 00:18 - 00:28
  - Henrik: Beskftigelse?
  - Flles: ???
- 00:29 - 00:37
  - Henrik: I har... ???
- 00:38 - 00:59
  - Henrik: Normal musikafspilingssystemtil fester?
  - P4: Youtube
  - P5: Ja og Grooveshark ogs
  - Henrik: Hjemme ved dig brugte vi i hvert fald ???
  - P5: “Ja, hvad man nu lige har der hvor man kommer hen, hvis man har et eller andet til at ligge p USB eller et eller andet”
- 01:00 - 01:17
  - Henrik: Tager I selv musik med?
  - P5: Jeg har aldrig musik med.
  - P1: Det har jeg heller aldrig nogensinde gjort.
  - Flles: S finder man bare noget p YouTube.
- 01:18 - 02:05
  - Henrik: Er systemet til at forst?
  - P5: Man skal sdan lige ind i det. Alts, det tager lige et kvarter, eller sdan noget, s synes jeg ogs man har rimeligt godt styr p det.
  - P4: Det er sdan set meget simpelt nok.

  - P5: Ja, man bliver sdan kastet ud i det, sdan uden at have fet noget information om det, er der mske noget af det der virker sdan lidt, men alts... Men jo, nr man lige fr det brugt lidt s er det rigtigt nemt. Der er ikke nogle helt vildt avancerede ting man skal kunne eller noget.

- 02:06 - 03:25
  - Henrik: Hvad synes I om den nye form for styringen af musikken?
  - P1: Jeg synes jeg fler mig lidt fanget. Det ved jeg ik. Alts jeg kan godt lide det der, selvom det er lidt belastende nr man er til festen, men det der med, at man fr sq lige lyst til at hre en sang og s bare g lige op: ¡fljter og signalerer indtastning p keyboard¿
  - Henrik: Det spontane?
  - P1: Ja, hvad man nu fr lyst til i sin brandert. Alts... Her kan man godt lige, hvis man fr lyst til at ombestemme sig, for at hre det folk rent faktisk gerne vil hre.
  - Henrik: S det at man ikke kan f sin vilje?
  - P1: Ja, det kan man jo ikke.
  - P5: Jeg har det prcis modsat. Alts, jeg synes det er jo lkkert ikke kommer de der hak, alts. Nu kan man i det mindste hre en sang frdig. Der er ikke noget der er mere belastende end at hre 20 sekunder af en eller anden sang, s 20 sekunder af en ny sang. Alts, s selv om det er en drlig sang man ikke lige har lyst til at hre s overlever man ogs de 3 minutter. Alts, s hvis man ikke har vret inde og stemme, s er man s selv ude om det. ¡griner¿

- 03:26 - 04:12
  - Henrik: Hvad er brugernavn valgt ud fra?
  - P5: Bare mit navn.
  - Henrik: Tnkt p genkendelse p situated display?
  - P5: Nh. Nh, overhovedet ikke. Jeg har bare valgt det. Alts, jeg har nok tnkt p at man skal kunne se hvem det er jo. S nu... Men nr man nu vlger sange s er det jo nogle gange hvor man kan... Hvor det bare kommer frem hvis det er sdan at det er en person der har valgt et nummer. Hvis man ikke ved hvem personen er s kan man jo ikke bruge funktionen til s meget. Men det kan man s se p billedet hvem det er. ¡griner¿ Hvis man ikke har taget et helt vildt mrkeligt billede.

- 04:13 - 05:18
  - Henrik: Brug af de forskellige dele af systemet?
  - P3: Det bliver s noget jeg m finde p, for jeg ku' jo ikke rigtigt f lov til det jo. Den var desvrre for lille. ¡Havde en X10-mini = app'en duede ikke¿
  - Henrik: Hvis du nu forestillede dig du selv havde en eller hvis I bare sidder med en har ¡peger p P5's mobil p bordet¿

- P3: Det er federe nr man kan se at boksene bliver strre derovre s, h... S bliver de spillet som de nste. Var det ikke sdan det fungerede?
- Henrik: Jo.
- P3: S kan man sidde og holde je med hvem der vinder.
- P2: Se hvem der mest populre.
- P4: Det er en fordel at... Nu snakkede vi ikke lige med dem der... Nu kender vi dem jo ik rigtigt, s... S kan vi jo sidde og stemme til en fest. S skal man ikke til op og diskutere musik og sdan noget der. ¡Gruppepres ved en fest hvor man ikke kender deltagerne?¿

- 05:19 - 05:55
  - Henrik: Kommentarer til mobil app'en?
  - P5: Ik andet end sgefunktionen, men den har vi snakket om. ¡griner¿
  - Henrik: Hvis man tnker p det man kan i det? Mden at bruge den p?
  - P1: Alts, jeg kan godt lide der er lagt en limit p de der... sange I har, alts... Nr man scoller, s man ikke bare sidder: ¡swiper lodret i luften¿
  - P5: Ja, ja. S man ikke bare nominere 250 forskellige sange.
  - P1: Ja ogs det. Mest nr du bare lige trykker next, sa fr en ny side sdan s du ikke bare skal blive ved med at scrolle.

- 05:56 - 07:14
  - Henrik: Hvad stemmer I ud fra? Stemmer I op eller ned?
  - P5: Jamen alts, jeg har gjort sdan at hvis der er en sang jeg ikke kan lide s stemmer jeg den ned for at hre den ¡griner sarkastisk¿
  - P5: ¡bner app'en og gr ind under Voting¿
  - Henrik: Du kigger p hvad der er og s enten op eller ned nr du lige ser...
  - P5: Ja, ja. Og s det som jeg ikke lige nu ved... Fx, nu kender jeg ikke den person her ¡viser Voting-siden p hans mobil og indikerer en sang i "Nominator" mode med billede af en person¿. S jeg ved ikke hvad det er han har valgt. S derfor s har jeg bare valgt at lade den st. S jeg ved ikke om det er godt eller skidt det han har valgt og hvad han har valgt. S derfor s lader jeg bare den st og s dem som kender ham vlger jo s at stemme den op eller ned.
  - P4: Jeg ved ikke om det er noget med hvordan det er blevet lagt op fra computeren af men nr der bare str "Greatest Hits", fx, det virker sdan lidt... ¡indikerer forvirring¿
  - Henrik: ¡Forklarer den tilfldige udvlgelse af modes¿
  - P5: S m man gamble.
  - P3: Ligesom noget der bare hedder "Rock".
  - P4: Der er ogs en her der hedder "Sprgsmlstegn".
  - P2: Der er meget forskellig rock.

  - P5: Ja, s gambler man bare.
  - P3: ¡nikker¿ S gambler man bare.
  - P4: Det er random ¡griner¿
  - P3: Nej jeg har lige krt den op i toppen s den skal vi hre ¡griner¿

- 07:15 - 08:20
  - Henrik: Indflydelse p brug af systemet? Tnker I over at det er noget alle skal hre eller at det er noget I har lyst til at hre i gruppen? Kan I bliver enige?
  - P3: Jamen, s lnge det er demokratisk s kan man jo bare vlge hvad man selv har lyst til at hre og s m de andre jo stemme den op eller ned.
  - P1: Hvis man kunne stemme ¡griner¿
  - P5: S m man jo kbe en ordentlig telefon jo ¡griner¿
  - P5: Det er ogs det der er fedt... Man str ikke... man skal ikke sdan st til regnskab for at man... at det er n person der har valgt en sang mens der sidder 39 andre der ikke kan lide den.
  - P3: Jamen det er jo det, hvis de ikke kan lide den s kan de jo bare stemme den ned. S kommer den jo ikke rigtigt lngere.
  - P5: S skal man ligesom ikke st til ansvar over for alle mulige andre mennesker.

- 08:21 - 08:54
  - Henrik: Library sprgsml ikke s relevante da P5 er den eneste med Library installeret i gruppen og han har delt 1 album.
  - P5: Jeg valgte at nominere en sang ¡fra sit eget album¿ og den blev s ogs afspillet s det krte fint nok.

- 08:55 - 09:51
  - Henrik: Ville det betyde noget, det med at kunne tage sin egen musik med?
  - P3: Det er da meget... Det giver da flere muligheder. S kan man bringe sin egen musik med. Det er jo ikke sikker at folk der sidder til festen de har lyst til det men s er der i hvert fald mulighed for at f det prvet.

- 09:52 - 11:00
  - Henrik: Retfrdighed i afstemning. Synes I det her er mere retfrdig end almindelig k?
  - P2: Jeg synes da det her er da i hvert fald mere retfrdigt. Som sagt playlisten bliver ved med at spille. Hvis du bare gr ind p YouTube eller Grooveshark, s nr den jo det der limit der, nr man ikke har sat flere sange ind og noget ikke. Det slipper man for her. Og s kommer det ogs til sin ret ved at jeg har lov til at stemme.

- Henrik: Sidder I med en fornemmelse af at kunne vre med til at bestemme hvad der bliver spillet?
- P4: Helt sikkert.
- P5: Jamen det gr man. Det er ogs noget af det der med alts... Man kan jo ikke brokke sig. Man er jo selv skyld hvis det er der ikke er kommet et eller andet nummer. S kan man g ind og stemme eller et eller andet.
- P1: Ogs hvis man er et sted hvor man ikke kender folk s er det jo bare lige og sidder der, ¡indikerer trykken p en mobil¿ "jeg vil gerne hre den der", i stedet for at g hen og sige, "hey, spiller du ik' lige...".

- 11:01 - 12:10
  - Henrik: ¡til P5¿ Profilbilledet, det har du bare taget?
  - P5: Det var et smukt billede. ¡sarkastisk¿ Jeg ville nok have valgt et andet hvis det var noget der skulle...
  - P3: Jeg brugte da lang tid p at tage det af dig. Jeg brugte rigtig lang tid p det.
  - P5: ¡griner¿ Ej jeg ville nok vlge et andet. Alts man kunne jo sagtens lave et eller andet sjov hvis nu det var en eller anden fest hvor folk de kendte hinanden. Alts... Lave et eller andet sjov.
  - P1: Nogle af vores gamle bukser...
  - P5: Ja sdan noget ¡griner¿.
  - Henrik: S billedet ville ogs afhnge af hvad for en forsamling det var?
  - P5: Hvis nu det var et eller andet sted man ikke kendte nogle mennesker alts, s bare tage et eller andet billede af... sdan et profilbillede.
  - Henrik: S du har taget sdan et lidt mere normalt billede fordi at det ikke lige er...
  - P5: Ja ja, alts havde det nu bare vret alle mulige kammerater s havde jeg nok lavet et eller andet mrkeligt.
  - P3: Ah, det plejer du sq ikke st tilbage for. ¡griner¿ Det er kun fordi han bliver video-interviewet.

- 12:11 - 12:37
  - ¡Liv smutter med kameraet over til Jesper der er ved at logge en anden p Playeren¿
  - Fr bug med "Get a new code"

- 12:38 - slut
  - ¡Samtidig med at hun hjlper med mobile filmes Jeni + Other person der str et par meter fra situated display. Sangen der spilles er nsten frdig.¿
  - Jeni: The question mark HAS to win. ¡det er den strste boks p skrmen¿
  - Other person: How do you know what the question mark means?

  - Jeni: Well, ¡peger¿ this is bigger.
  - Other person: Yeah, but I mean...
  - Jeni: I know. You'll see. ¡peger, sangen skifter, question mark-sangen vinder¿
  - Other person: Uh, the question mark is gone.
  - Jeni: No but that's what wins ¡peger¿
  - Other person: ¡ser p Now Playing info¿
  - Person uden for kameraet: Why does it always play from me? It's shared by me. ¡skjult stolthed over tit at blive valgt og vist p situated display¿
  - Other person: ¡kigger p Person uden for kameraet, kigger tilbage p Now Playing info¿ So you shared the question mark song?
  - Person uden for kameraet: Apparently I have shared a lot of music and everybody is voting for me. ¡stolthed - mske Sren?¿

SD1 - Video - 00008.MTS

Interview med Informatikerne Sren og Anders.

- Start - 00:33
  - Henrik: Hvad er jeres alder?
  - Sren: 24
  - Anders: 27
  - Henrik: Hvad laver I?
  - Sren: Informatik p 10. semester
  - Henrik: Du ¡Sren¿ har haft bde mobil og et library stende?
  - Sren: Ja
  - Henrik: Og har du ¡Anders¿ vret oppe og bruge tablet?
  - Anders: Ja.
- 00:34 - 01:11
  - Henrik: Hvilke systemer bruger I selv til musikafspilning?
  - Sren: Tja, min laptop, h... iTunes.
  - Henrik: Hvis det er dig selv eller?
  - Sren: Ja hvis det er mig selv. Andre steder det... Jamen plejer jo tit at vre det.
  - Henrik: Sdan hvad folk har.
  - Sren: Ja, nemlig.
  - Anders: Det er 100
  - Sren: Ja men ofte synes jeg... S er det bare en computer og noget... Ja.

- Anders: Ja det er altid computere.
- Henrik: Ja
- Sren: Ja, laptop eller desktop... men ja, computere i hvert fald.

- 01:12 - 02:47
  - Henrik: Synes I det er nemt at forst systemet?
  - Sren: Ja det synes jeg.
  - Henrik: Noget specielt?
  - Sren: Det jeg tnkte lidt over... Det der med at den vlger tilfldige beskrivelser af... Nr du nominerer en sang... Det kan nogle gange vre lidt forvirrende at du har nomineret en sang og s skriver den “Rock“ og... Nogle gange er det lidt svrt om det du har nomineret... svrt at se om det rent faktisk er kommet derop. Det skal man lige vnne sig til i hvert fald. For det meste kan man godt se hvad der er nyt, fx nr kommer et sprgsmlstegn kan man godt regne ud at det er det at man s har nomineret, men nogle gange kan det godt vre lidt svrt hvis man forventer at der kommer til at st det man har nomineret. Men ja selvflgelig det der med at den stoler fuldstndigt p de der ID3-tags, s der kan bare st alt muligt crazy. Nogle gange str der bare “Greatest Hits“. Okay ¡griner¿. Det er jo sdan lidt lige s godt som det der sprgsmlstegn. Sdan er det jo. Men ja konceptet forstr jeg godt.
  - Anders: Men nu kendte vi ogs... Vi havde set det i forvejen og vi er mske ogs lidt mere nrdede end gennemsnittet.
  - Sren: ¡griner¿
  - Anders: Det der med at det er... der er tilfldighed i, at der er et spil det er... det forstr man jo ikke. Man kan godt forst at man har nomineret noget, det kommer jo klart igennem men man ved ikke lige hvor det er og det er mske ogs bare en del af det.
  - Henrik: S overordnet set sdan nogenlunde, men detaljerne tager lidt at finde ud af?
  - Sren og Anders: Ja det gr det.

- 02:48 - 03:43
  - Henrik: Styringer/kontrollen af musikken? At den er delt ud?
  - Sren: Synes det er super fedt faktisk. Synes det virker rigtigt godt. Det er en rigtig fed ide synes jeg. Det virker som om at strstedelen synes det er rimelig godt ¡griner¿
  - Anders: Det giver jo ogs et blik af folks musiksmag der er til stede i stedet for det er en eller anden samling af en eller andens musik...
  - Sren: Ja fordi det er jo altid svrt nr der ik... Det der med at alle kan have en indflydelse... Fordi hvis det bare er en del holder en fest s stter man et eller andet tilfldig musik p og det er altid svrt at finde noget og... s gr folk over og skifter. Det der med at den spiller en sang af gangen og man ikke stopper midt i det hele det er rigtigt fedt. Og det der med at alle kan bestemme og komme med forslag, det er ret cool. Det er en rigtigt god ide.

- 03:44 - 06:08
  - Henrik: Hvad valgte du ¡Sren¿ brugernavn ud fra?
  - Sren: Det er det brugernavn jeg bruger alle steder p Internettet. Jeg er ret sikker p der er ingen her der vil genkende mig nogen steder fra med mindre de kender mig andre steder fra. Men s tog jeg jo et rigtigt godt billede af mig selv som er virkelig, virkelig flot og som bliver vist oppe p skrmen hele tiden fordi det benbart er min musik alle vil hre ¡griner¿ ¡stolthed¿. Mske ogs fordi jeg er den eneste der har delt noget musik.
  - Henrik: Kan godt vre der er en hvis ratio mellem hvor meget i forhold til den totale...
  - Anders: Nr man alligevel tager et billede...
  - Sren: Nr man tager et billede s er navnet egentlig lidt ligegyldigt... kunne jeg forestille mig... Det er jo ikke ndvendigvis alle der kender ens navn heller. Jeg tror billedet gr rigtigt meget i forhold til og... Hvis man tager et billede af sig selv vel og mrke ¡griner¿.
  - Anders: Jeg tror de fleste de vil ikke have deres eget navn men de kan godt lige klare...
  - Sren: Selv om jeg havde kaldt mig “Sren“ s var der nok mange der ikke ville lgge mrke til det alligevel og gerne vide hvem jeg var pga. det s...
  - Liv: Men vidste I godt at billedet kom derop da I tog det?
  - Sren: Nah, det fremgik jo ikke af programmet. Jeg kunne godt ligesom tnke at det var nok det der var ideen. Nu vidste jeg s ogs hvad det var det gik ud p systemet. Men jeg havde ikke lige sdan... Jeg havde ikke tnkt p at det var min musik der blev spillet hele tiden ¡griner¿. Jeg vidste godt hvad det var, jeg kan ikke huske hvorfor jeg vidste det... Om det var fordi jeg havde... ¡vender sig om mod skrmen idet en ny sang starter¿ Ej det var mig igen hva’? ¡griner¿
  - Anders: Jeg tror ikke det er noget folk de tnker p det i den kontekst, fordi det er stadig et selskab hvor man skulle... Man er ikke bange for at vise sig selv overfor de folk der er der ligesom...
  - Henrik: S det afhnger ogs lidt af den forsamling man er i?
  - Sren: Det tror jeg ogs ja, for hvis det er sted alle kender hinanden s er navnet jo sikkert nok, men her fx, hvor der ikke er srligt mange der ndvendigvis kender hinanden, eller... der er mange der ikke kender hinanden i hvert fald tror jeg... der tror jeg det har mere at sige... Jeg ved ikke hvor meget folk de kigger om hvem det er... de der billeder... om folk lgger mrke til det.
  - Henrik: Kigger du p det? Andre?
  - Sren: Jeg kigger p fordi det er mig selv hele tiden ¡griner¿. Jeg lgger mrke til dem jeg kender. De billeder som... Jeg lgger ogs mrke til nr Jespers er deroppe og sdan noget... Men jo jeg har ogs lagt mrke til nogen af de andres... Jeg har faktisk tnkt p nogen af... P et tidspunkt hvor der var en “Shared by“ en eller anden som jeg ikke vidste hvem

var men jeg kunne se jeg havde set ham fr. Det lagde jeg mrke til. Men jeg vidste ikke hvad han hed og jeg... S der lagde jeg faktisk mrke til det p baggrund af hans billede. Jeg lagde mrke til at jeg havde set ham.

- 06:09 - 08:18
  - Henrik: Holder I je med displayet?
  - Sren: Mjah, alts lige nu her synes jeg jeg har siddet og kigget en del og p det. Jeg ved ikke om jeg ville gre det sdan hvis det var sdan en... Det var ogs fordi vi ved det er det vi er her for eller hvad man skal sige. Og fordi det er sjovt at sidde og stemme p ting ¡smgriner¿. Men det er jo ogs det der er fedt ved det, der er ogs det element af det at det er sjovt at bruge. Og s holder man selvflgelig ogs je med det. Jeg ved ikke om man ville gre det sdan uafbrudt i flere timer af gangen men... S kan man mske g lidt til eller fra eller sdan.
  - Anders: Nej opmrksomheden den kan jo hurtigt komme vk igen, det er ogs det jeg sidder og tnker at... Fordi det er mobil og... nr man sidder til fest eller hvis det er p et eller andet... alts privatfest eller noget strre s er det jo ikke det fedeste at folk de sidder hele tiden sidder og kigger p mobiltelefonen. S det er ligesom der skrmen den skal gre en del af arbejdet.
  - Henrik: Drager for meget opmrksomhed eller det godt kan vre som baggrunds...?
  - Anders: Nej, det jeg mener det er at hvis alle folk de sidder og kigger p deres mobiltelefon s... der skal skrmen vre den der faciliterer at... hvad det er der sker. Og s kan man se... Nr man s sidder og bladrer igennem s stor en musiksamling... det tager jo ogs en del tid fordi man sidder og sger efter...
  - Sren: Ja det kan hurtigt blive uoverskueligt hvis der er rigtigt mange der har delt noget.
  - Anders: Og det er jo ikke sdan det man er interesseret i til en fest, det skal jo vre socialt og...
  - Sren: Men det er det jeg tnker... Afhngigt af hvor mange der deltager og sdan noget... S kan det jo ogs vre ... Ville jeg forestille mig at det mske ikke var alle der sad og stirrede p den i uendelighed, man kommer mske til og fra... Og der var nogle der valgte noget nogen gange og s kommer man sdan lige op og... og s tilfjer man nogle ting... Nogle gange har man lidt indtrykket af at her nu det er folk der sidder og stemmer p den samme og den samme og den samme og alle sidder lige nu at nu skal vi hre den sang. S det vil mske vre sdan lidt mere flydende eller hvad man skal sige hvis der var lidt mere variation i hvem der brugte det p forskellige tidspunkter og det kunne jeg ogs forestiller mig det mske ville gre hvis det var... afhngigt af hvor mange mennesker der er der bruger det og sdan noget...
- 08:19 - 11:19
  - Henrik: Brugen af mobilen?

  - Sren: Det har meget at gre med hvad der str p skrmen synes jeg. Det har ogs noget at gre med selvflgelig at nominere nogle selv men jeg tnker ogs p hvad det er der str deroppe. Fx hver gang der er sprgsmlstegn skal man stemme p det ¡griner¿. Og jeg mener ogs nr man kan genkende noget musik og sdan noget. Men det synes jeg helt sikkert. At selvflgelig kan det mske ogs have noget at gre med at jeg har delt en masse musik fra min egen computer s jeg ved hvad der er s jeg ved hvad jeg selv har s p den mde. S jeg gre det bde for at nominere noget og det har ikke s meget at gre med det der er deroppe ndvendigvis men jeg ser ogs p hvad der er i hvert fald og s stemmer p dem. S det er ogs motiveret af skrmen, absolut.
  - Anders: Mit forslag det er at i stedet for at man nominere specifikke sange s skulle man mske nominere noget der var kortere i forhold til at udvlge det, fordi nr man sidder og bladre igennem alt det der katalog, der er s mange sange... s det skal vre mere generaliseret eller sdan noget...
  - Sren: Det synes jeg faktisk ogs... den der "Random" ting som jeg ikke helt kunne forst hvordan fungerede, det lader til at den bare laver en tilfldig liste af sange og s kan man vlge ud fra den. Jeg troede egentlig det gik p den bare ville tage en tilfldig sang og s nominere den uden videre men jeg kunne ikke helt forst hvad der skete fordi s var der bare en masse sange listet lige pludselig.
  - Anders: Det kan ogs vre at den bare i stedet for at man kunne vlge ud... nominere alt s kunne man bare nominere et vist udvalg af noget. Udvalget skulle s vre baseret p en eller anden ting... alts en intelligent udvlgning af en sang i stedet for bare random.
  - Sren: Det kunne ogs vre fedt at nominere en kunstner eller sdan et eller andet mske. Hvis man er ligeglad med hvad for nogle... hvis man er ligeglad med hvad for et nummer... s vlger den selv et tilfldigt nummer inden for den kunstner eller album eller... det er nok lidt bredt at sige genre. Det kan nemt blive langvarigt at skulle sidde og klikke sig igennem alle de der ting.
  - Liv: Det har mske ogs mere noget at gre med stemning til festen. S er det ikke ndvendigvis s man skal hre det har bestemte nummer med "Dizzy Mizz Lizzy" men bare noget i den genre, som er lige s hurtigt i beatet.
  - Sren: Ja apropos det, s kunne det vre fedt hvis man kunne vlge at nominere noget musik der lignende s den selv kunne analysere det og... finde... ikke ndvendigvis ud fra genre men ud fra musikken, MP3-filen. Det er nok lige fancy nok men ¡griner¿ Jeg ved heller ikke om man ville gre det.

- 11:20 - 17:04
  - Henrik: Indflydelse p valg af sange?
  - Liv: Jeg s tidligere at I sad og stemte p sdan en sang som egentlig var sdan en lidt irriterende sang?

– Sren: Ja den der “Friday“? Det var jo bare fordi den er verdens drligste sang og det var rigtigt sjovt. Og der var... det var lidt for at ligesom Rickrolle, alts Rick Ashley, det var ogs bare fordi det er skgt. Men ellers s er det egentlig bare lidt... jeg har ikke tnkt s meget over stemningen her... eller ikke bevidst i hvert fald. Jeg ville nok ikke stte en masse hardcore techno p nu fordi det kan jeg nok ligesom fornemme at ville nok bare ikke passe, men det er jo nok... Alts det er ikke noget jeg har tnkt over, men det...

– Anders: Man har mest lyst til at gre det for skgs skyld, ikke for at irritere andre sdan direkte.

– Sren: Nej, det jeg ellers har taget det er noget jeg som jeg har haft lyst til at hre, noget jeg har forventet ville vre sdan rimeligt bredt og rimeligt rammende for folk. Ikke sdan jeg har siddet og tnkt sdan srligt over det, men jeg tror alligevel sdan underbevidst...

– Henrik: S vlger man ikke bare sdan helt efter eget...

– Sren: Nej man prver at vlge noget som alligevel er kendt, ikke sdan en obskur kunstner som folk mske ikke ved hvad er.

– Anders: Men det kan ogs vre svrt at placere... hvor man lige vil placere en stemme en gang imellem fordi... man er ikke klar over... jeg sidder bare og kigge p skrmen s kan jeg g op og stemme, men hvis jeg bare ser titlen p sangen s aner jeg ikke hvad det er. Og det ved jeg ik helt... hvis jeg virkelig vil vide hvad det er s gr jeg ind og googler det og finder ud af det mske er et eller andet “Jonas Brothers“ eller sdan noget... det s meget interessant ud til at starte med men s... der er et eller andet der i hvert fald. Titlerne er meget svre at vurdere hvad det er...

– Sren: Det er det med at den vlger noget tilfldigt. Det er bde lidt fedt og lidt underligt. P en eller anden mde kan jeg egentlig godt lide det fordi man ikke helt er sikker p hvad man stemmer p, nogle gange er det ogs bare lidt underligt. Som sagt isr det med at man nominerer noget og det kan s vre svrt at se om det rent faktisk er kommet derop. Fordi hvis jeg nominerer et eller andet nummer og jeg kigger efter det’s titel s str der bare “Rock“ eller “Green Day“ eller et eller andet men jeg har taget et specifikt nummer... man er ikke helt sikker p om det er kommet derop selvom det selvflgelig er bekrftet herp ¡peger p mobilen¿ men som bruger er det ellers synes jeg egentlig meget cool det der med at det er tilfldigt fordi det er lidt sjovt at stemme p et eller andet man ikke helt ved hvad er.

– Anders: Jeg synes ogs det er rigtigt fedt at man kan se det der “Shared by“ og s bare stemme p det. Fordi s ved man...

– Sren: Ja det er fedt nok man kan stemme p en person...

– Anders: Det er et eller andet med at hvis man kender personen s kender man deres musiksmag og s...

– Sren: Der synes jeg bare det er virkelig mrkeligt s mange folk der bare stemme p mig fordi jeg tror ikke der er ret mange der kender mig men de stemmer bare p mit billede... fordi det er et virkeligt godt billede ¡griner¿ ¡stolthed¿

- Kvindestemme uden for billedet (Jeni?): ¡Ved sangskifte¿ Yes!
- Anders: Men man kan ogs kombinere de der ting... i stedet for det bare var n parameter, sdan “Shared by“ eller sdan noget s “Shared by“, “Title“ og et eller andet. S fik man et bedre indtryk af det.
- Sren: Den stter kun billede op p “Shared by“, ikke hvem der har nomineret og sdan noget?
- Liv: Jo det kan den ogs godt gre.
- Sren: Jeg synes der kommer rigtigt tit billedet op af hvem der har delt dem...
- Henrik: S nu nr der er f der har delt s kunne det vre interessant hvem der s havde valgt din musik?
- Sren: Jamen prcis. Det er lidt det.. nogle gange er det mske mere relevant at vlge hvem der har valgt det end hvem der har delt det fordi folk kan jo have dele alt muligt. De kan jo have musik i alle mulige retninger.
- Henrik: Kigger I s ogs p hvis det er dit nummer hvem der s har stemt p den?
- Sren: Ja nogle gange gr jeg ¡kigger p skrmen - griner og siger¿ “Chuck Norris“. Ja jeg synes det er rigtigt fedt det der med billeder. Det synes jeg virkelig er rigtigt godt. Bortset fra at der er billeder af mig hele tiden ¡smiler¿ Men det er sjovt at se de der folk der har...
- Anders: Der m godt vre mere fokus p det der bliver spillet i hvert fald. Der er rigeligt plads rundt omkring til alt muligt andet.
- Sren: P en eller anden mde tnker jeg p at det der supporters... dem er der jo mange af, den cykler igennem dem, det kunne p en eller anden mde vre fedt hvis der blev vist flere af dem p en gang sledes det ikke bare var et af gangen. Det er sdan lidt...
- Henrik: Det der med at man ikke sidder og holder je med det hele tiden.
- Sren: Jamen det er det, s ser man lige... nogle gange ser man bare 3 billeder af den samme...
- Liv: Det er svrt at se hvor mange der synes det er god musik fordi det skifter og man sidder ikke og tller hvornr ender lkken.
- Sren: Nej det er nemlig det. Mske var lsningen bare at have et tal p alts 1/7 eller whatever...
- Anders: Og den der nu har nomineret han behver faktisk ikke at blive vist fordi det er lidt redundant.
- Sren: Men man har jo ikke stemt p dig selv ndvendigvis nr man har nomineret. Man kan jo bde nominere og stemme p dig selv... jeg tror de fleste stemmer p sig selv nr de har nomineret.
- Anders: Ja det gr de jo.
- Sren: Det gr jeg selv i hvert fald ¡griner¿

- Anders: Man behver ikke... man skal bare ikke kan stemme p det. Det er implicit. Hvis du nu har nomineret en sang og du har stemt p den selv og s er der 2 andre s kommer du selv op hele tiden. Det ser drligt ud i forhold til at s er der 3 billeder af den samme hvis du ogs har delt den.
- Sren: Det er det, jeg har tit set 3 billeder af mig selv deroppe ¡griner¿ Men ja, s kunne man godt lave et eller andet med at hvis det var den samme der havde delt og nomineret i og med at der kun vises t billede for de 2 s kunne det godt vre t billede hvis det var den samme person s det ikke blev vist 2 gange. Men det er en lille ting.

- 17:05 - 19:10
  - Henrik: Har du valgt alt din tilgngelige musik over p afspilleren?
  - Sren: Nej det har jeg ikke... Jeg har gjort det lidt p samme mde som jeg nominerer. Jeg har taget nogle af de ting som jeg tror folk kunne lide... noget af det jeg selv ville hre og noget af det som jeg kunne forestille mig folk ville hre... som de 30 ting af Rick Ashley og Rebecca Black ¡griner¿ Men ellers s... s jeg har ikke taget hele min musiksamling...
  - Henrik: Da du valgte p library-siden?
  - Sren: Alts p selve computeren der valgte jeg bare hele mit iTunes bibliotek. S tog den s kun det der var der var MP3 s der lavede den selv en udvlgelse kan man sige fordi alt det jeg har kbt p iTunes kan den s ikke vise... Men jeg har s heller ikke delt alt det jeg har... ¡sangskift - kigger p skrmen¿ S er der bare billeder af Jesper over det hele ¡griner¿ Jeg har ikke delt alt det jeg har lagt i library, det synes jeg faktisk var en rigtigt fed feature at man kunne gre det fra telefonen, netop fordi jeg sad da jeg tilfjede min iTunes mappe til computeren s kunne jeg ikke fjerne fra listen der, men det er sdan set lige meget nr man styrer det fra telefonen bagefter, fordi det virker meget godt det der med... Fordi at jeg synes det er fedt nok at man bare kan tilfje alt sin musik og s kan man efterflgende vlge hvad for noget af det man vil have ud... p telefonen, fordi det er trls at skulle sidde ved sin computer og vlge den mappe og den mappe og den mappe. Det er bedre bare at tilfje det hele og s kan man tage det senere, hvad det er man vil dele.
  - Henrik: Igen lidt efter hvad du regner med folk vil hre?
  - Sren: Ja prcis. Og det synes jeg virker rigtigt godt p den mde faktisk.
  - Anders: Jeg vil give Sren ret i at det er rigtigt smart at gre det p telefonen nr du er der, fordi i praksis s gr jeg ud fra at computeren er et andet sted...
  - Sren: Ja det er meget nemmere at stte det til at kre i baggrunden og den deler alt min musik hele tiden og afhngig af hvor jeg er henne kan jeg vlge hvad jeg vil dele. Det er rigtigt smart at gre det p den mde.

- 19:11 - 20:41

  - Henrik: Betyder det noget at du ikke kun har en fremmeds iTunes library. Giver det noget at kunne tage sin egen musik med?
  - Sren: Det giver noget fordi man ved hvad det er man har og man ved det er filer der virker. Fordi nr man er til fest s er Grooveshark og sdan noget er meget fint, men der er mange rigtigt mange filer der ikke er det de skriver de er. Man ved i hvert fald det musik man selv har med det ved man formentlig om er rigtigt eller ej, man ved det duer. Der er selvflgelig ogs andre folks musik men stadigvk, jeg synes egentlig ogs at man har en ide om hvad for noget musik der er at spille... Alts hvis man ellers er et sted hvor man kun har musik lokalt kan det jo vre meget begrnset hvad der er. Det at man bare har en ide om hvad man selv har i hvert fald, det synes jeg faktisk er ret cool.
  - Anders: Jeg synes i hvert fald til privatfester, der er altid utilfredshed, fordi udvalget...
  - Sren: Ja fordi det ender altid inde p YouTube og s er det nogle drlige kopier og s hrer vi kun halvdelen og det... Jamen det er rigtigt nok. Man kan aldrig se folk tilfreds. Jeg tror klart det ville vre fordel at have sin egen musik med, isr hvis der er nok der har deres egen musik med.

- 20:42 - 21:49
  - Henrik: Hvad med retfrdigheden ved systemet? Er det fair? Skal det vre retfrdigt?
  - Sren: Alts det jeg tnkte det er den der tablet, man kan rigtigt nemt stille sig derop og s bare st hver 10. sekund og bare stemme p Rick Ashley hele tiden som Jeni gjorde men det...
  - Anders: Det kan man jo ogs gre til en fest. Du kan ogs altid g op og s...
  - Jeni i baggrunden ved sangskifte: ¡kommenterer p nste sang¿ You're finally gonna get it. Yes!
  - Sren: Jamen det er ogs det, det er bedre det her end at du gr op og skifter nummeret hele tiden. S p den mde... Fra telefonsiden synes jeg det virker meget cool det der med at man kan stemmer 3 niveauer p hver. Det synes jeg virker meget cool. Og det er ogs bedre det der med at det er alle der har noget at sige i stedet for det er 1. Og at... Isr det der med at den spiller en hel sang s folk ikke afbryder musikken, det er helt centralt.

- 21:50 - slut
  - Liv: Har I noget at tilfje?
  - Anders: Den eneste ting jeg sdan er opmrksom p det er at selve udvlgelsen af musikken skal ikke bare vre i centrum. Det er ligesom der man lige sdan m prve at balancere det hele. Nr det er en test af det s er folk ogs opmrksomme p det. Der kunne mske godt vre en hjere form for automatisering af det, kunne man mske overveje. Hvis nu fx nr man nu har adgang til folk de har valgt deres musik de

gerne vil dele s kunne man tage sammendraget af hvad det er folk de deler, hvilken genre er det, og s lave en form for automatisering ud fra det.

- Henrik: Nr den lber tr, fylder den allerede op med helt tilfldige sange.
- Anders: Ja okay. Det er ogs det, hvis man sidder en hel aften... Fordi folk de sidder ikke en hel aften med deres ¡indikerer brug af mobil¿. Hvad sker der s? S er det bare random.
- Henrik: Ja lige nu er det ligesom shuffle.
- Sren: En ting jeg tnkte p: jeg savner at kunne sge i den her liste over kunstnere.
- Henrik/Liv: ¡griner¿ Den har vi hrt fra nsten alle.
- Sren: Ja ¡griner¿. Man skal sidde og scrolle... Ogs fordi der er de her X antal per side... Frst s undrede jeg mig over der ikke var flere kunstnere, s s jeg der var en next-knap.
- Henrik: Vi har en masse usability-ting men det er ikke s meget det vi kigger efter.
- Liv/Henrik: Tak for hjlpen.