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Development Of The TonePrint Community:
A case study in user involvement

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Chapter 1

Introduction

The philosophy of human-centered design is to start a design process with a good understanding of the users and their needs. A common issue with developing products without involving the users in some way is that the products will be developed according to how the developers believe it should look and behave, and not how the users would expect it to. This will result in deficiencies for the users' interaction with the products, as they are likely to make mistakes and get confused. This is where good design becomes essential. If something unexpected happens, and the users are capable of easily fixing it, much satisfaction can arise for the users (Norman 2013, pp. 6-9). User experience design (UX) intends to provide the users with this satisfaction by designing products according to their needs, capabilities, and behaviour, which includes multiple aspects of branding, design, usability, and function (Foundation 2019). This, however, haven't been fully integrated in the industry yet, as there still seems to be some misconception to what a human-centered design approach provides in development. This report will therefore start with an interpretation of the benefits of human-centered design in correlation with the terms UX and usability, before investigating different approaches for involving the users in the design process at a specific company.

The danish tech company **TC Electronic (TC)** is the collaborating company for this purpose and has collaborated with students of Engineering Psychology on previous occasions. TC was originally formed in the early 1970's by Kim and John Rishøj in Aarhus, Denmark, and today they are worldwide known manufactorers of effect units for musicians. Besides effect units, they also produce other audio equipment such as amplifiers, sound and picture production systems, and broadcast systems (Electronic 2019a). The collaboration was agreed upon through dialogue with TC themselves in shape of some mail correspondence before meeting with them at their headquarters and agreeing on a scope for the project. TC currently don't have a dedicated strategy for implementing methods for investigating UX and usability in their design process, but it is something they are interested in implementing in the development of future products.

1.1 The benefits of human-centered design

The term *user experience* was originally coined by Don Norman in 1993 while working at Apple. He defined it as everything that touches upon the user's experience with the product from first acquiring it to actually interacting with it and later evaluating this experience (Norman 2019). Numerous interpretations have since been formulated with *allaboutux.org* containing a vast amount of these. Despite the differences in phrasing, what seems to be a common trait for these is that UX should be considered a broader term also covering other terms such as usability (UX 2019). By investigating an ISO standard on human-centered design for interactive systems, this is emphazised, as UX is defined as *a person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service.* Three notes further elaborates how this includes all aspects of the person's emotions, beliefs, preferences, etc. (ISO 2010, p. 3). In the same ISO standard, usability is defined as *the extend to which a product can be used for specified goals with effectiveness, efficiency and satisfaction in a specified context.* (ISO 2010). Both these definitions support that UX should be considered the broader term, as usability is related to the functionality of a system, including the users' successes and failures during interaction, while UX also contains a hedonic aspect.

Designing with a human-centered approach holds multiple benefits. Reka (2017) describes these with regards to both the benefits for the users but also for the design process in general and the members of the design team. Firstly, if the developers in the company in question understand their users, they will then be able to understand the problems they may face by observing how they interact with a system. Secondly, sales increase when products satisfies their users. As it was mentioned in the introduction, a common issue is when products are developed solely from the developers' understanding of how it should look and behave. The developers then expect the users to have the same understanding, but since the users typically can't speak with the developers, the burden of communicating this understanding lies solely on the product itself including the documentations and manuals involved (Norman 2013, p. 31). If it isn't clear to the users how they interact with the product, they won't have a satisfying experience with it. However, if the appropriate information is available to make the product understandable and usable, especially in situations when things go wrong, the users are then more likely to have a pleasent experience (Norman 2013, p. 32). Finally, the development team itself can also benefit from a human-centered design approach. The better understanding of the users' needs, the design team have, the better their basis is for estimating the required amount of time and money for both development and subsequent maintenance of the product (Reka 2017).

Despite the outlined benefits of a human-centered approach to the design process, it is not yet fully integrated in the industry, and the reason for this lies in the difference of how the academic world develops methods for UX and usability testing, and how the industry utilizes these. Dennis Wixon stated in 2003 that *"The literature evaluating usability*

methods is fundamentally flawed by its lack of relevance to applied usability work" (Wixon 2003), this supports the concept of a gap between academia and industry. Several studies have since been made on this with Øvad and Larsen (2015) being of interest. The purpose of this study was to investigate how 8 different companies changed how they worked within the fields of UX and usability over a period of 2 years. Interviews were held in 2013 and 2015 to uncover a positive development in the companies' understanding of UX and usability during these two years. Almost all of the companies had developed or were developing ways of implementing UX in their design process with examples such as low-fi prototyping, usability testing, workshops, personas, expert evaluations, etc. (Øvad and Larsen 2015, p. 48). In correlation with this, it is important to emphasize that almost all of these companies follows the agile *Scrum* framework in their design process, which means that development is carried out as an iterative process in the form of sprints with the option of going back and making changes to the product in between these.

More papers have recently been released on this topic and the challenges facing it. In a paper by Silva et al. (2018), the focus is on analyzing the evolution and current state of agile UX to provide a brief overview of theses challenges yet to be solved. It also takes its starting point in the increasing attention UX has gotten in the last 16 years, as designers and developers do understand the importance of each others work but don't know how to synchronize their daily operations in a meaningful way. As previously mentioned, the challenge lies in making UX relevant to the specific work in focus, but the challenge also lies in making everyone in the design team understand UX as a team discipline rather than a role in the team. As such, a more thorough understanding of UX and the agile framework is required to help both fields reach a shared understanding of each other (Silva et al. 2018, p. 2). For Persson et al. (2018) the focus is specifically on how UX and agility contribute to each other. The notion is that what helps a software developer to be agile may not help a UX consultant to be agile in the same way and vice versa. This is already well addressed as true, and the findings presented in the study further supports this notion. The study was conducted in an unspecified danish software company with *Conboy's theory of agility* as research approach, which is elaborated on in the paper (Persson et al. 2018, p. 3). The study showed that the two practices contributed substantially different to agility for UX consultants and developers in correlation with different aspects of the design process. Finally, by consulting Nielsen Norman Group it is clear that despite the tendency of UX professionals perceiving Scrum meetings as barriers to productivity, they should still be involved in these meetings to stay engaged and aware of what's going on in the team (Kaley 2019). They propose that UX professionals take part in the scrum framework equivalently to any other member of the design team. This includes daily meetings addressing the questions *what did you do yesterday? what will you do today?* and *what is in your way?*. This is considered important, as the UX professionals usually are working ahead of the development team. The UX professionals should furthermore engage in the work of the other members of the team, as they may be able to help resolve potential issues, they are facing.

1.2 The Scrum framework

As previously stated, much of the problem with employing a proper UX strategy in software development companies is due to UX not reconciling well with the agile scrum framework. The development teams of TC Electronic also employs this framework, and as such it seems fit to provide a proper description of it.

The scrum framework has gained popularity in the industry of developing software and hardware, as it has contributed to faster market times, greater flexibility, higher-quality products, and customer satisfaction (Gonçalves 2018, p. 40). The overall concept is that the work is split into development iterations referred to as *sprints*. These periods are typically of one month or less where a clear objective is set up and carried out by the *Scrum team*, which consists of the members of the development team. There are three different roles for the members, each expected to be self-organising and cross-functional without being dependent on others outside the team (Gonçalves 2018, p. 41).

- **The Scrum Master** serves, much as the name indicates, as the leader of the Scrum Team. His primary objective is to make sure that the work to be done is understood and carried out by the Scrum Team.
- **The Product Owner** focuses on maximizing the work of the development team. He manages the list of requirements that the end product must meet, also known as the *The Product Backlog*. This includes defining the backlog items and prioritizing them in order to optimise the value of the work done by the development team
- **The Development Team** consists of the remaining members of the Scrum Team, which typically is three professionals. Their goal is to execute the objectives established by The Product Owner and Scrum Master, and have them done by the end of sprint.

The sprint starts with the initial planning by the members of the scrum team. During this phase they determine realistic goals for the sprint in correlation with what they want to achieve. The steps required to achieve their goals for the sprint are then determined from the backlog items as well through discussions with the product owner. When this is settled, the sprint starts. During the sprint, the team sets aside 15 minutes every day in order to synchronize activities and develop a plan for the next 24 hours. this is simply referred to as *The Daily Scrum* (Gonçalves 2018, p. 41). By the end of the sprint, the period is reviewed by the team in order to evaluate what has been achieved during the sprint, and what still needs to be done in order to complete the current sprint within the assigned time frame. Finally, a retrospective meeting inspects the sprint in order to discuss possible improvements for the next sprint to come. Figure 1.1 provides a graphical elaboration of this process.

Scrum Process - Overview

Figure 1.1: a graphical overview of the Scrum Process. `https://luis-goncalves.com/what-is-scrum-methodology/`

1.3 The TonePrint concept

An investigation of how TC can apply human-centered design approaches to their design process also requires focusing on a specific case in order to make it more relatable. Keeping it generic is expected to make it difficult to engage with for future design processes, and the choice was therefore made to use the plans for a future sharing platform for TonePrints as case in this project. Another term used for this platform is simply *TonePrint community*, and for this to make more sense, it needs to be put into context with the general TonePrint concept, which encompasses a certain type of guitar effect pedals. A description of this is therefore required, and it is done on the basis of three different papers released by TC themselves (Andersen 2012; 2014; 2015), including how they describe it on their own webpage (Electronic 2019b).

Effect pedals in general are well known units for guitarists and bassists alike, spanding multiple music genres. The pedals work by taking the input signal from a guitar, allowing the users to edit it for a set of parameters, and as such getting a different output

signal. The users can then activate these changes from a single switch on the pedal. An example of a TonePrint pedal is displayed on Figure 1.2 with editable parameters such as *decay*, *tone*, *level*, etc. Each of these parameters are edited by turning their respective knobs, giving the users a range of ways to change the sound. The TonePrint concept was developed with this limitation in range as motivation, as it offers the users ways of editing the sound beyond the parameters on the physical knobs. Using the TonePrint application, the users have more parameters and a vast selection of custom presets to choose from. These presets are what the term *TonePrint* covers, and they are either created in collaboration with professional artists or from templates by the common user. These are referred to as *Artist TonePrints* and *User TonePrints* respectively. When using a TonePrint pedal, the users can select one of these presets and choose to edit it further or transfer it directly to the pedal, where the physical knobs also allow for further editing (Andersen 2012).

TC has collaborated with multiple guitarists and bassists, creating TonePrints for effect pedals used by the artists themselves. After the artists are satisfied with their TonePrints, they upload them to the TonePrint library in the app with the aid of TC, making them available to all users. As such, the users of the TonePrint app can aspire to match their sound to that of their idols. For User TonePrints the overall concept is the same. They differ in the fact that the creator isn't a famous guitarist, but the TonePrint is still made using the application and can be transferred directly to its effect pedal. However, when it comes to sharing these User TonePrint with friends and other aspiring guitarist, a platform for this purpose doesn't exist yet.

Figure 1.2: An example of TonePrint pedal *Hall of Fame 2* from TC Electronic.
https://www.tcelectronic.com/Categories/Tcelectronic/Guitar/Stompboxes/
HALL-OF-FAME-2-REVERB

1.3.1 The TonePrint software

As previously stated, the exploring of TonePrints start with the TonePrint application available for smartphones and tablets. However, the software is also available for PC and MAC, and the reason for this distinction lies in the difference of how a TonePrint is transferred to its respective pedal. For PC and MAC the user is required to use a cable from the computer to the pedal, but through the tablet and smartphone application, the user also have the option of beaming it directly to the pedal. whatever the platform, however, when opening the software the user is introduced to a list selection of different effect pedals, each holding a vast number of TonePrints created by famous guitarists. After selecting an effect pedal from this list, the user is then presented a new list selection of the many guitarist who have created TonePrints for this pedal. When selecting one of the guitarists, and depending on whether the guitarist have created more TonePrints for the same pedal, the user is then presented a bigger view of this specific TonePrint with a description of it and its creator. An example of this is displayed on Figure 1.3. Depending on the users' motivation when opening the application first time, they can also choose to browse by artist instead of pedal, if their starting point is to find out what it takes to sound like their favourite artist.
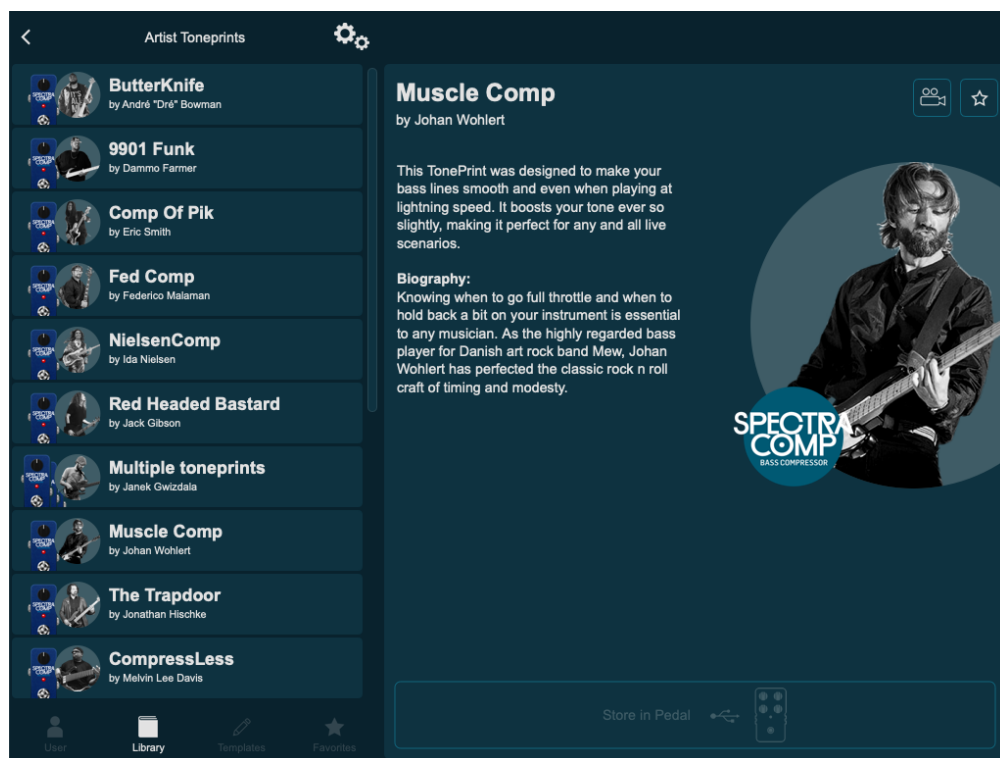
Figure 1.3: The view in the TonePrint application after selecting an effect pedal and a TonePrint. This example displays a TonePrint created by Johan Wohlert of the danish rock band *Mew*.

1.4 Research question

As it has been elaborated on in this chapter, the purpose of this project is to investigate how the design process at TC Electronic can apply a human-centered design approach with the future TonePrint community as case. This leads to the research question for the project, which is as followed:

> *How can methods for a human-centered design approach be applied in the design process of the TonePrint Community?*

This question will be investigated though different methods, starting with an investigation of TC's current design process, in order to later establish ways of involving the users in the design of the TonePrint community.

Chapter 2

Evaluating the design process of the TonePrint system

As explained in chapter 1 and established in the research question (see section 1.4), the purpose of this project is to aid TC Electronic towards applying a human-centered design approach to their design process of a future TonePrint community. This will be done by first investigating the design process of an existing product in the realm of the TonePrint community i.e. their current TonePrint app. This choice is made on the basis of the expected difference in the design processes, depending on whether the product in focus is hardware or software based, and furthermore, the TonePrint app lies close to the TonePrint community. The following chapter focusses on this task, starting with choosing an approach for getting a better understanding of the TonePrint app, before moving on to getting a better understanding of the design process of it.

2.1   Approach

For the analysis of the design process of the TonePrint application, different approaches can be taken, and these should therefore be taken into account. An important speculation is, whether the analysis should be based on observable or self-reported data, and these two approaches will therefore be examined.

Observational study

An observational study is a classic method used in field studies. This can be used to observe the entire development team, in order to analyse their every day work process and the overall design process. This allows the observer to create an understanding of the design process, which isn't biased by the individuals of the development team, who might have problems recalling every aspects of the process. However, a classical observational study won't allow the observers to gain knowledge of the background of the individual team members decisions. For this, there instead is a method with many things in common with classical observational studies. This is called a *contextual inquiry*. In contextual

inquiries you're normally observing the use of a product by it's target user in the right setting in order to analyse usability. Besides the observation part of this method, it also relies on the observer to interview the user, while he or she is interacting with the product. This enables the observer to get a better understanding of what the user is thinking. This method could be utilised in this project by engaging in observing the design process and then interview the team members, when the observers would find it relevant. One problem with this method, however, is that it might be too time-consuming for this project. As mentioned in section 1.2, TC utilises the SCRUM framework, and getting a better understanding of their design process would therefore require observing one of these sprint periods, and preferably more. Another problem is that a design process consists of several phases of meetings, iterations, and rethinking design ideas, which is difficult to cover adequately.

Self-reporting methods

Compared to the observational methods, there is a large branch of methods which rely on getting the involved personals' own reflective view on the process. When looking at the aspects which is found problematic for evaluating the design process through observations, these wouldn't necessarily be problems for a self-reporting inquiry. The long span of the design process, and the iterative process which the TonePrint app already have gone through, could be explored by getting the people, who have been a part of the process, to elaborate on it. This of course relies heavily on the memory of the respondents and their willingness and ability to reflect upon former decisions and processes. There are many different approaches which may be used to examine the design process using the involved personals reflective knowledge. In one end of the spectrum there is the highly structured survey presenting close-ended questions, whereas in the other end there is the unstructured focus-group inquiries, focusing on discussing open-ended questions in smaller groups (Adams 2015). A middle ground between these approaches would arguably be the semi-structured interview approach. The scope of this approach is to use both open and close-ended questions for further clarifications than close-ended would provide on their own. By using the approach of a semi-structured interview to analyse the design process of the TonePrint app, it allows the individual interviews to better focus on areas found interesting, based on the answers provided by the subjects. The interview will more or less become a conversation in which the subjects describe their view on the design process based on questions prepared before the interview, and questions created on the go to further clarify the answers to the prepared questions. Taking this into account, it's decided to conduct this analysis using the approach of the semi-structured interview.

2.1.1 Preparing the interview

When preparing an interview, it's important to establish what purpose the interview serves, which may by outlined in the form of research questions. These research questions serve as objectives for the interview, anf they are as followed:

1. What is the TonPrint apps developers understanding of their target users and how was it applied in the design of the App?
2. How was the decision process when deciding on, and designing new implementations for the TonePrint App?
3. How did the SCRUM framework affect the design process of the TonePrint app?
4. Which aspects does the development team find important for the design process of the TonePrint community?

In order to meeting the purpose of the interview, the research questions above are used as guidelines for generating the final questions for the interview. Before these questions are generated, it's necessary to establish a ground knowledge of the TonePrint app and how it's designed. This will help framing the questions towards being more context specific which might help avoiding too arbitrary and non specific answers, that otherwise would be difficult to interpret. By properly framing these questions, they may also help frame appropriate follow-up questions on the go if deemed necessary. In order to obtain this knowledge, an exploration of the TonePrint app should be conducted.

2.2 Heuristic evaluation

As mentioned in subsection 2.1.1, it's necessary to explore the TonePrint app before conducting the interview. When exploring the TonePrint app it's also decided to create a usability evaluation. The objective of the evaluation is to highlight usability problems that may be addressed in the interview. This enables questions to be directed at specific parts of the app, hopefully resulting in answers that describe the decisions related to the development of specific parts of the app.

Many different methods and approaches exists for evaluating the usability of a system, which differ in thoroughness, time and resources. Given that the scope of this evaluation is to generate questions and explore the application, it's decided to use a method that is fast to plan, conduct and analyse. A method, which is deemed applicable with the given terms, is the Heuristic evaluation, which is described by (J. Nielsen 1994c). The scope of this method is to have a team of evaluators, preferably with some expertise regarding usability design, evaluate the usability of a systems interface, by comparing elements with a set of usability design heuristics. The result of the heuristic evaluation is a list of usability problems, defined by the heuristic they violate, and why. J. Nielsen (1994c) recommends that the number of evaluators should be among three or five. It's stated that less than three evaluators likely won't be able to identify a sufficient number of usability problems, while more than five evaluators will have problems identifying new usability problems, that haven't already been identified by another evaluator. The use of the evaluation in this study is however not to identify all usability problems in order to redesign the interface but to find examples to base the interview questions on. The heuristic evaluation is therefore still considered applicable, even though the only evaluators are the two authors of this thesis.

	Heuristics (J. Nielsen 1994a)
1	Visibility of the system status
2	Match between system and the real world
3	User control and freedom
4	Consistency and standards
5	Error Prevention
6	Recognition rather than recall
7	Flexibility and efficiency of use
8	Aesthetic and minimalist design
9	Help users recognize, diagnose, and recover from errors
10	Help and documentation

Table 2.1: The Ten usability heuristic described by J. Nielsen (1994a)

A key factor of the heuristic evaluation is obviously the heuristics which are used for identifying the usability problems. J. Nielsen (1994b) defines nine usability heuristics which identifies different kinds of usability problems. The heuristics were created by analysing seven sets of existing usability heuristics, with a combined total of 101 heuristics. The paper resulted in nine usability heuristics that can be used in a heuristic evaluation, however, while referring to his own heuristics (J. Nielsen 1994b) Jakob Nielsen describes ten heuristics (J. Nielsen 1994a; J. Nielsen 1994c), adding One more to the list. These ten heuristics are used for this evaluation and is listed in Table 2.1.

2.2.1 Procedure

By following the steps described by J. Nielsen (1994c), the evaluation is divided into two phases. The scope of the first phase is for the evaluators to get familiar with the system they are evaluating. Here they are to inspect and navigate through the system and learn the way around it. The purpose of this is to prevent identifying false problems due to a lack of knowledge of the system and to ensure that the evaluators don't miss any areas of the system, while identifying usability problems. The second phase is the evaluation phase, where the evaluators find usability problems by comparing different elements of the interface to the usability heuristics Table 2.1. When something in the interface violates a heuristic, it's noted by the evaluator which in the end leads to a list of violations of the heuristics, hence usability problems.

2.2.2 Evaluation Results

Based on the procedure described above, each evaluator noted the identified usability problems by shortly describing it and noting the heuristic it violates. The problems found by each evaluator is compared and combined, and these results are presented in Appendix A.

2.2.3 Discussion

When looking at the findings of the heuristic evaluation in Appendix A, it's important to keep in mind that the purpose of this project isn't to accommodate the usability problems in a redesign of the TonePrint app. The purpose of this evaluation is to explore the TonePrint app in order to obtain the necessary insight for making the interview context specific. One thing that might have affected the findings of this evaluation is that the two evaluators aren't necessarily end-users of the system. This might have resulted in problems identified from a lack of knowledge regarding domain specific design patterns. This further highlights the interesting point of how TC have directed their design towards their target users, or how the users otherwise have been considered during the design process, which is mentioned in subsection 2.1.1. A variety of problems were concerning overall problems with the evaluators not finding the information expected through a series of interactions. This should lead to questions inquiring the decisions regarding the structure and design of information though the app. Some more specific problem that should be addressed is the problems which seems to be platform specific, either for PC, MAC, Android or Iphone. This is interesting because it might enlighten how design decisions is made or how different users are targeted though the design.

Chapter 3

Interview with the TonePrint app development team

In section 2.1 it's decided to conduct a semi-structured interview focused on evaluating TC's design process of the TonePrint app. The information derived from this interview will then serve as a baseline for shaping the design process of the TonePrint community towards a human-centered approach. When designing the interview, each question should serve the purpose of help answering one of the four interview research questions presented in subsection 2.1.1, in order to derive the desired information. Furthermore, the knowledge obtained by exploring the TonePrint app through the heuristic evaluation helps framing the questions towards being context specific. It also provides the knowledge necessary to have a conversation with the developers in terms of having them elaborating their answers and digging into more specific areas of the app during the conversation.

3.1   Designing the interview guide

When planing the semi-structured interview, a list of questions have to be prepared which purpose is to ensure that the interview research questions is answered. The interview is conducted in Danish because the members of the development team all are danish, and even though conducting it in English might make the results easier to include in this paper, the risk of potential languages barriers could make it more difficult for the subjects to elaborate their answers.

The first of the interview research questions is "**What is the TonPrint apps developers understanding of their target users and how was it applied in the design of the App?**. Two examples of questions that might help answer this question could be: '*How have your knowledge of your users affected the development of the TonePrint app, and where do you have this knowledge from?*' and '*What type of feedback do you receive regarding the TonePrint editor and how do you use this feedback?*'. Even though the two questions differ quite a bit, they both provide information that is relevant for the interview research question. The first question is directly asking if their user knowledge (understanding of the user) have affected the development, which is almost similar to the

interview research question. Depending on the answer, the interviewer may ask follow up question that could dig deeper into how the knowledge have affected a specific part of the app. The second question focusses on the feedback received, and this might enlighten how the developers create their understanding of the users.

The second interview research question states "**How was the decision process when deciding on, and designing new implementations for the TonePrint App?**". Examples of questions answering this is: '*How did you decide the information structure of the TonePrint app, regarding both the menu structure and the different ways they may be categorised?*' and '*What is the reasoning for the differences of the app given the platform used? e.g information of not having a pedal connected, the search function and how the video is played?*'. Both of these examples are searching for information about how decisions were made though the design process. They are focusing on quite different ares, where the first focusses on a general decision regarding the app, and the second focusses on specific differences between platforms, which were spotted during the exploration of the app.

The third interview research question is "**How did the SCRUM framework affect the design process of the TonePrint app?**", and an example of a question highlighting this is '*What positive and negative effects has the use of the SCRUM framework had on the development of the TonePrint app?*'. This question is very direct in terms of answering the interview research question, and in itself it isn't very context specific. However, when conducting the interview as semi-structured, the interviewer might direct the question towards some more specific examples which have been highlighted earlier in the interview.

The fourth and final interview research question states "**Which aspects does the development team find important for the design process of the TonePrint community?**", which the following example tries to answer 'If you should mention five important aspects that we should focus on when developing the TonePrint community, what would it be?'. This question allows for an open conversation between the interviewer and the subject, because it's phrased as a the interviewer searching for help.

It's important to remember that the interview is a semi-structured interview which means that the list of questions prepared for the interview serves more as a check list than a chronological step by step guide. It's not necessarily important that the questions are asked in a certain order, and the interviewer should be ready to ask follow up questions based on the answers for further elaborations. If the interviewer finds that one of the prepared questions already have been addressed through earlier answers and conversations, it's not necessary to make the subject repeat themselves. The interview guide is located in Appendix B and consists of 17 questions in danish and a short introduction that is read to the subjects. The interview is planned to take approximately one hour, but it may vary depending on the answers given by each subject.

3.1.1 Conducting the interview

The interview with TC was planed through the company supervisor for this project, who also helped find the relevant people to interview. The interviews were conducted in a meeting room at TC's headquarter in Aarhus, due to practicality.
Four subjects with different roles participated in the interview, with the company supervisor being one of them. The other three consisted of a graphical designer, a software programmer, and the SCRUM product owner, respectively. The length of the interviews fluctuated between 23 minutes and on hour, and both authors of this project participated in the interviews. Each interview were audio recorded and transcribed for the purpose of analyzing the data. The transcribed interviews are located in Appendix F.

3.2 Method for analyzing the interview

As a result of choosing to do a semi-structured interview, the interviews took different forms in correlation with the field of knowledge and interests of the individual subjects. In order to meet these differences it's decided to use the qualitative analysis method 'Thematic analysis'. The scope of a thematic analysis is to organise the data gathered through e.g an interview in themes, explaining patterns or other interesting aspects of the data (**PDF:Braun2006**). The themes created through thematic analysis are intended to make the interpretation of data, scattered across ones data set, easier.

3.2.1 Thematic analysis approach

When describing the phases of a thematic analysis in (**PDF:Braun2006**) as a step-by-step guide it's emphasized that it is just a guide, and not a set of rules because it would counter the flexibility that this method provides. It's described that there is six phases for the thematic analysis, which is listed in Table 3.1. These phases embodies all of the process from going through collecting the data, to describing the findings of the analysis.

	Phases of Thematic analysis
1	Familiarizing yourself with your data
2	Generating initial codes
3	Searching for themes
4	Reviewing themes
5	Defining and naming themes
6	Producing the report

Table 3.1: The six phases of a Thematic analysis as depicted in (**PDF:Braun2006**)

The first phase which focus on getting familiar with the data of the data starts when the interviews are being transcribed. When transcribing the interview some interesting things might be found or patterns might start taking form. Even though transcription just is a way of transforming one's data it will also help providing a better insight and

understanding of the data.

The second phase of the analysis is to code the data transcribed through the first phase. The process of coding is that extracts of the data that are found interesting is marked and given a code that in few words indicate the content of the data extract. This results in a long list of highlighted parts extracts of the transcribed interview with associated codes.

In the third phase the codes derived from the second phase is used to form themes. In this process the different codes are combined across the data set forming themes that highlights interesting aspects or patterns in the data. This results in different lists of data extracts from different parts of the interview or different subjects, which combined constitute a theme of the answers from the interview.

The fourth phase of the analysis is a reviewing phase, where all the themes are revisited. In the process of shaping the themes in the third phase it might be difficult to retain an overview of the content of the different codes and in different themes. This may result in themes containing codes describing to different content to keep them in same theme, or themes may be so similar that they may be combined. The purpose of the fourth phase is to revisit the themes in order to ensure that they make sense.

The scope of the fifth phase is focused on naming and describing the themes which have been identified through the earlier phases. Here the content of the individual themes is described in order to be used in the overall analysis of the interview.

The sixth and final phase is the writing part of the analysis where the obtained knowledge in the shape of themes is used to accommodate the purpose of the interview.

Chapter 4

Results of thematic analysis

Through the six phases of the thematic analysis section 3.2 354 codes were created and attached to data extracts from the interview conducted at TC section 3.1. These codes have then been grouped together in themes highlighting different aspects of the interview. In total 33 themes were derived from the thematic analysis. A Description of the individual themes is located in Appendix C, while the groupings of codes and data extracts, which each theme is based on, is located in the digital appendix Appendix F. In order to use the themes to accommodate the purpose of the interview they are grouped as sub-themes under a overall label, which makes it more comprehensible. The sub-themes and overall labels is shown at Figure 4.1.
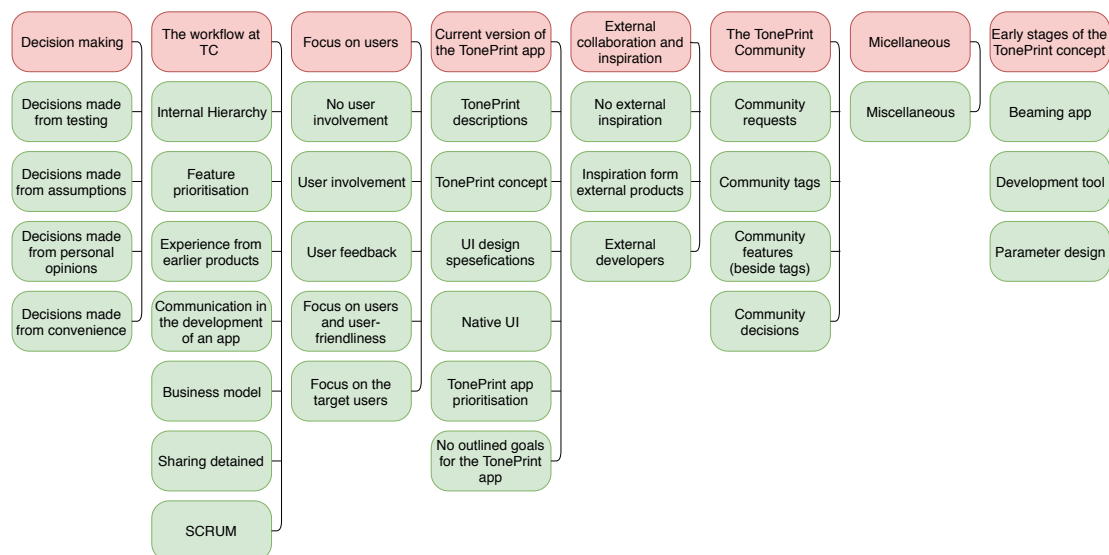
Figure 4.1: This illustrates an overview of grouped Themes as sub-themes under a overall label

4.1 Findings from thematic analysis

As seen in Figure 4.1 has the 33 themes been grouped under eight labels according to the scope of the themes. As indicated by the labels some groups compare more directly to the interview research questions e.g the groups 'Decision making' or 'Focus on the user'. However is the other groups of themes still found to be providing some useful information in regards to evaluate development of the TonePrint app. Each group is given a short description below, except the 'Miscellaneous' which includes codes and data extracts that isn't found useful for this study.

Decision making

The themes in this group is all focusing on different aspects of how TC have made decisions through the development process of the TonePrint app. It's emphasized that most of their decisions have been based on gut-feeling towards what may be the best solution for the user. The design of the parameter settings interface were e.g. based on an assumption of it being the typical way of doing it. A repeated pattern is that the decisions haven't been based user studies.

The workflow at TC

These themes describes different aspects of how the work flow affected the development of the TonePrint app. An important point is how TC prioritize the features to be implemented. The weigh out how important a feature is found to be against how time consuming and resource demanding it is to implement. The product owner is in the end the one deciding what to implement and in instances also how it should be implemented. Further is it emphasized how useful they find the SCRUM framework and when tasks seems to large to fit a three week sprint it's deconstructed into smaller task.

Focus on the user

The themes in this group focus on how the user sometimes are in the focus of development, even though one theme again states that there have been no direct user studies focusing on the TonePrint app. The idea of the TonePrint system does however stem from a study with bass players making presets for at amplifier. One way they accommodate the users is by including feature requests they get through their web page or facebook, whereas these requests is added to their product backlog. They have a general idea of wanting to make their products user-friendly and when asked how it's suggested to "ask them what they want". It's stated that they have three target user to accommodate, pedal only users, artist TonePrint users and TonePrint creators. Though user might be fluctuating between thous.

Early stages of the TonePrint concept

Through these themes it's seen that the TonePrint concept have evolved over time. It all began by taking former development tool used to creating parameter setting of a sound, which they at one point took used in collaboration with professional artist in order to make artist TonePrints that could be beamed to a pedal. One challenge have been to make this setting of parameters understandable for people who aren't sound engineers.

Current version of the TonePrint app

The themes in this group sheds light on some concepts and issues of the current TonePrint app. One concept is the descriptions of the TonePrints, which currently i written by the marketing team. The description is found to be an important aspect to include in the TonePrint community in order to ease the searching in what they expect to be a large amount of TonePrints. It's stated that there were a problem when the newest version of the TonePrint app was launched. Way the version was implemented in order to work cross platform resulted in problems for a android users because the app was very slow responsive. Further it's also apparent that when redesigning the editor interface there ware a focus of making it more user friendly there is however no indication of how this user friendliness were defined or measured.

External collaboration ind inspiration

This group focus on TC's take on inspiration from external products and their use of external collaboration. It's apparent that there hasn't been any key souce of inspiration for the development of the TOnePrint app and that it's developed as a original idea. It's however considered to look at other products in the field of music presets who have a sharing platform when designing the TonePrint community in order to see what works and what doesn't. Finally is it mentioned that the first TonePrint app was designed by an external designer, but the design was implemented by TC's own programmer.

The TonePrint community

This group consists of themes that describes different aspects of the TonePrint community regarding both features and overall considerations. The feature that's allocated most focus is to implement a system where TonePrints are given tags, which serves as small categorizing stamp. Other features as subscribing to other users or a filtering system more advanced in the current is also seen as features that should be implemented. The decision about creating the TonePrint community is generated through many user requests of being able to share one's TonePrints withe other users. However isn't it decided yet how it should be implemented. A point of which there still is doubt is whether or not it should be implemented as a extension of the current app or if it should be it's own thing.

4.2 The TonePrint development process

Through the thematic analysis of the interview an understanding of TC's development process of the TonePrint app have been derived. It's found that they in general haven't conducted any user studies as a part of their development process which may be a factor to why their representation of their target users is somewhat limited. This comes to show when talking of how decisions have been based mostly on gut-feeling e.g when implementing the new design of the app of the app. One way that user are involved by TC acting on feedback received though their website, music tribe community or their facebook group TonePrint junkies. Through these channels they receive feature request which is added to their product backlog, on the same level as their own ideas to new features. Another way these channels have been beneficial is when bugs are reported. But a repeated pattern found is that the users haven't been taken directly into account when designing the app.

When deciding whether an feature from the product backlog should be implemented it's comparison of importance versus time and resources. The TonePrint community is an example of this, where it was found somewhat important, because there were may requests for it, however was seen as a very time consuming and resourceful implementation. This resulted in TC waiting for a time where the necessary time is at hand. When it's decided to implement a feature it's divided into tasks that fits a three week sprint. This means that tasks to large to complete in one sprint is deconstructed in order to fit the design sprint. This way of using the SCRUM framework is praised by all in the interview and it's commented that it helps focus on the task at hand so that things that aren't important at the current state of the design process doesn't get unwanted attention.

When framing the attention against the development of the TonePrint community it's stated that it's important to ask the users what they want, which might be a very simplistic view on user centered design. Several ideas of features were suggested which further will be elaborated in chapter 5. It's apparent that there are different viewpoints towards what should be implemented in the TonePrint community, which further confirms that there should be conducted some studies focused on the future extend of the TonePrint community.

Chapter 5

TonePrint Community concept

In order to accommodate the research question of how methods of user centered design may be applied for the design process of the TonePrint community, it's desired to establish a model of the TonePrint community based on the knowledge obtained through the thematic analysis of the interview in chapter 4. This model will serve as a base when deciding the tasks that lies ahead, in which user centered design methods may be applied.

5.1 Conceptual model

In (J. Johnson and Henderson 2012, p. 17) a conceptual model is descried as "*A high-level description of an application. It enumerates all concepts in the application that users can encounter, describes how those concepts relate to each other, and explains how those concepts fit into tasks that users perform with the application*".
In order to compose a conceptual model of the TonePrint community it's necessary to decide which features and functionalities that needs to be implemented and how they interact with one another. Since these decisions haven't yet been taken on a business level, does the decisions presented in this section only serve the purpose of this project. The decisions is based on interview with the development team of the TonePrint app.

5.1.1 The TonePrint Concept model

When creating the conceptual model it's necessary to look at the task domains in which the user till perform activities to reach their goal. Different users have different purposes for using the community and therefore will there be more than one task domain to consider, while designing the community. For this suitable to look at the different target user groups, which shortly is mentioned in section 4.1.
On Figure 5.1 it's depicted how users of the TonePrint concept are categorized into the three groups, Pedal only users, TonePrint Users and TonePrint creators, And what aspects of the TonePrint concept they uses. The 'Pedal only users' are defined as the users who own a TonePrint pedal, but doesn't use the TonePrint functionalities of the pedal and just are using it as a regular pedal. The TonePrint Users are defined as those

who use the TonePrint concept to find and beam Artist TonePrints to their pedals. These users are therefore connected to the Artist Library of the TonePrint application. The TonePrint Creators are defined as those who uses the TonePrint concept to create User TonePrints, which they can use with their pedals. These users are therefore connected to the Editor and the User TonePrint Library. The connecting arrow between TonePrint Users and Creators on Figure 5.1 indicates that these users isn't necessary different people, but might be the same user using the system differently.
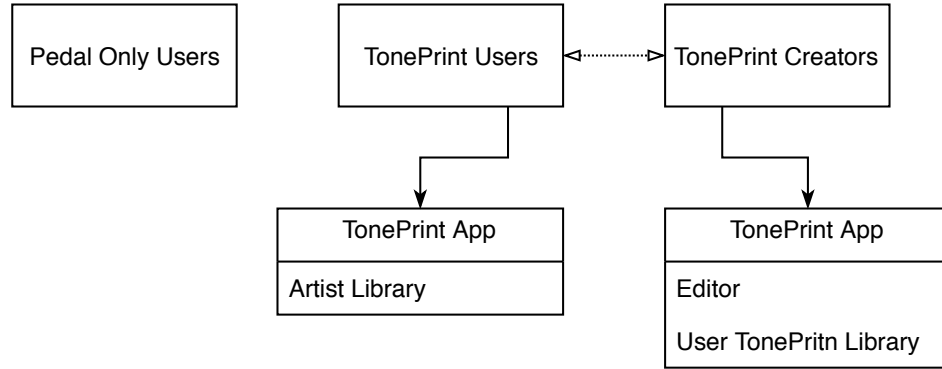
Figure 5.1: This illustrates the different groups of users of the TonePrint concept

The definition of the different user groups of the TonePrint concept will also be applied to the concept of the TonePrint Community, besides the 'Pedal Only Users'. This is because they aren't using the TonePrint functions and thereby don't have any use of the TonePrint Community. The features listed in Table 5.1 are suggested features to accommodate both the TonePrint users and creators in the community. The features are based on the ideas and suggestions from the development team through the interview.

Ref. nr	Features
1	Uploading TonePrints
2	Categorize by tags
3	TonePrint description
4	Search
5	Rate TonePrint
6	Subscribe to users
7	Recommendations
8	User profile

Table 5.1: The left column contains the number which is used to refer to the feature in the right column

The features 1, 2 and 3 in Table 5.1 are all closely related and accommodates especially the task domain of the TonePrint Creators. The feature of uploading is simply to enable user to upload TonePrints to the community, that they have created with the

editor. This feature covers the main function requested by the users which is the ability to share TonePrint with each other.

Feature 2, Categorizing by tags refers to the idea of letting users use tags to categorize the TonePrint they have uploaded. The purpose of these tags are to easily allow other users to identify which categories the TonePrint belongs to, which also enable users to find the TonePrints by searching on desired tags.

Feature 3, TonePrint description allows the creator of a TonePrint to write about the TonePrint, similar to the descriptions of the Artist TonePrints in the current TonePrint application. The description might contain information about the parameter settings, inspiration, self-promoting text or likewise.

Feature 4 is a search function which users can use to search for TonePrints, either by name, tag, artist, pedal or likewise. The current search functionality in the TonePrint application, which only is idle for android, is very limited and wouldn't be sufficient, as mentioned in Appendix A.

Feature 5, the Rate TonePrint feature, is based on the idea of letting TonePrint users, who have tried a TonePrint creators TonePrint, rate that TonePrint. This rating could work as a motivation for creators to create more TonePrints, while it as the same time gives the TonePrint users the opportunity to see how much other users like the TonePrint.

Feature 6, Subscribe to users, are a feature which enables users to follow other users. A user could for instance have tried a TonePrint created by a certain other user and like it to a degree of which he want's to see which other TonePrints that user have created, and wants to be notified when new ones are created.

Feature 7, Recommendation, this feature is suggested to help users find and explore TonePrints. This could be recommendations like, "People who like this TonePrint also like these", "These are the highest rated TonePrints for your pedals" or "These TonePrints will at something new" etc.

Feature 8, Community Profile, is a feature which sums it all up. This profile is going to be a 'Front Page' for the users containing their own TonePrints, their recommendations, the TonePrints of those they subscribe to and the option to make a personal description and link to personal youtube, soundcloud or likewise sites, as a self-promoting feature.

How the eight features above works on a detailed and technical level won't be a concern at the conceptual model. The goal of the conceptual model is to explain the relationship between functions, which can be used to perform the activities necessary for the user to reach a goal (**Henderson2012**).

5.1.2   Community Model

The conceptual model of the TonePrint community consists of several concepts, which includes the already mentioned features Table 5.1. The conceptual model of the TonePrint community is illustrated on Figure 5.2.
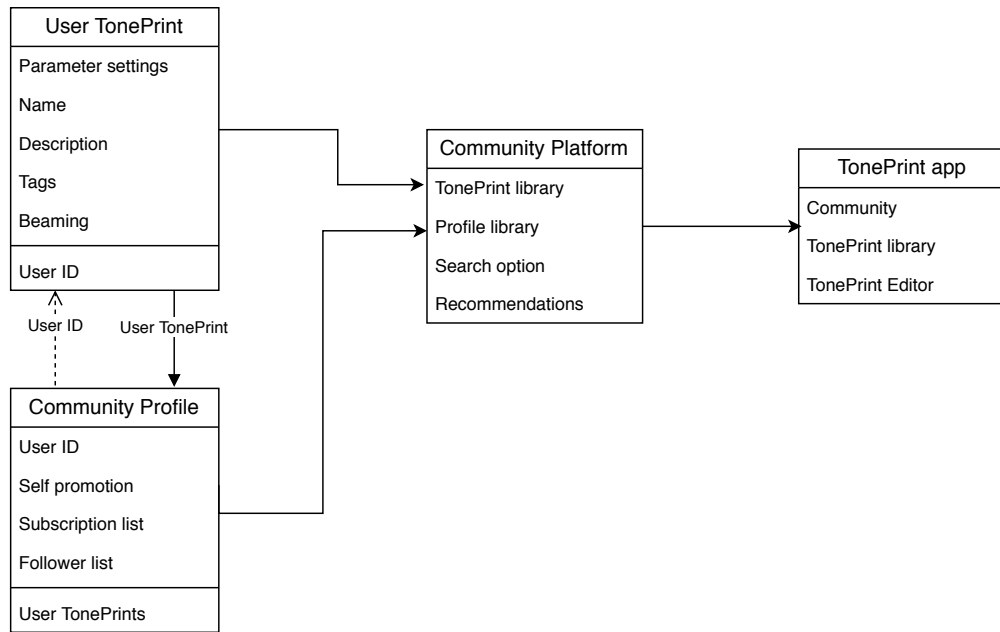
Figure 5.2: Illustration of the relationships of the concepts that makes up the Communities conceptual model

The first concept in the model is the User TonePrint concept, which contains the following: Parameter settings for the TonePrint. The name of the TonePrint. A description of the TonePrint. Tags that categorize the TonePrint . The beaming functionality. And lastly User ID, which is inherited from the Community Profile, which identifies the creator. This concepts differs from the original User TonePrint concept by adding the description, tags and User ID, which all are new additions, which aims at making it easier to find desired TonePrints. The User TonePrints are uploaded to the Communitys TonePrint library, for all user to find. It's also uploaded to the users own Community Profile so it's always easy accessible.

The second concept of the model is the Community Profile which contains: User ID that is used to identify the profile. Self-promotion which could include self description or links to other personal sites etc. Subscription list, which is a list of the other user that a user are subscribing to. Follower list, which is a list of those who subscribe to that user. And lastly the User TonePrints which is a list of the users self created TonePrints. The Community Profile is crucial to shape the concept of including the users into a community, instead of just having a simple Upload/Download site. Some of the idea of self-promotion stems from a workshop conducted by TC (Andersen 2015). The Community profile will work as a starting point for users when interacting with the Community.

The third concept is the Community platform which contains: The TonePrint library which give access to use and rate all the uploaded TonePrints. The Profile library give access to visit all of the Community Profiles and subscribe to them. Search option is simply a function which help user find the TonePrint they are looking fore, e.g by searching

30

on the before mentioned tags. Recommendations where the system suggest TonePrints or users based on the TonePrints they use or likes. The Community Platform sums up all of the features and concepts which shapes the TonePrint community concept, by using both the User TonePrint concept and the Community Profile concept.

Lastly there is the concept of the TonePrint application which contains: The Community Platform, which represent all of the features and concepts of the TonePrint Community. The TonePrint library represent both the User TonePrint library and the Artist TonePrint library, first described in subsection 1.3.1, and seen in Figure 5.1. The TonePrint Editor, which is used to create the User TonePrints, which is described in subsection 1.3.1 and seen in Figure 5.1. The only change in the TonePrint application concept is the addition of the Community concept. As mentioned in section 4.1 is there still some different viewpoints regarding the extend of the TonePrint concept being a part of the current TonePrint app.

5.1.3 Community Use Cases

Contrary to the Conceptual model that depicts how the different concepts of the tonePrint Community are connected, is the scope of the use cases to depict how the TonePrint Community is used to complete the tasks that users might use it fore. The use cases depict in this section is used to illustrate the overall idea of the use of the TonePrint community. The use cases is used provide a broader idea of the TonePrint community concept.

The two use cases described below is created to accommodate the use of the two user groups depicted in Figure 5.1.

TonePrint creator

A use case of the TonePrint community for the user grouped earlier defined as TonePrint creators is to create and upload a TonePrint, so that it may be used by other users. This use case is illustrated on Figure 5.3. The four boxes in Figure 5.3 represent Two users (User 1 and User 2) and two platforms of the tonePrint app (TonePrint Editor and Community Platform). User 1 represents a TonePrint creator. At the beginning of this use case User 1 uses the TonePrint editor to set the parameters of the TonePrint being created, which after it's given a name and is saved. User 1 hereafter uploads the TonePrint to the community platform. As a part of the uploading process User 1 write a description of the TonePrint, so that other users may want to try it out. User 1 also assigns tags to the TonePrint that may help categorize it, and make it show up when other users searches for one of the tags.

TonePrint user

The use case for the user group earlier defined as TonePrint users is also illustrated in Figure 5.3. Here it's seen that user 2 interacts with the Community Platform in order to find a TonePrint to use. User 2 searches for a TonePrint, which could be done by searching for specific pedals, effect types, other users (TonePrint creators) or tags that

categorize the TonePrint. After finding a TonePrint, which in this case is created by User 1, is User 2 trying out the TonePrint by playing by beaming it to his pedal and playing on his guitar. After User 2 have decided that he likes it he rate it, so that other user might see that it's a good TonePrint. Finally User 2 chooses to subscribe to User 1 so that he will be notified when User 1 creates a new TonePrint.
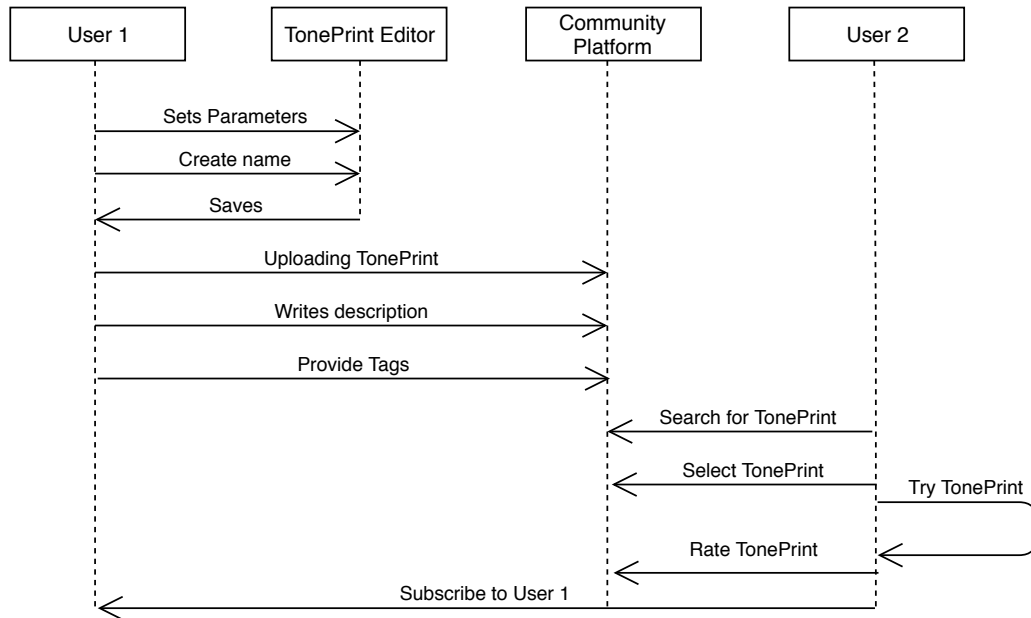
Figure 5.3: a graphical overview of the TonePrint Community use case

Chapter 6

Tasks and Methods

The purpose of the following chapter is to answer the research question presented in section 1.4 by proposing tasks for the development of the TonePrint community, in which the involvement of users is considered beneficial. The tasks are proposed on the basis of the results of the Thematic analysis, and they focus on how to acquire the necessary information from the users to design content in the TonePrint community. The descriptions of these tasks will include relevant methods, and how they may be employed best to the design process of TC Electronic. This is done on the basis of their SCRUM framework and from personal experience with utilizing these methods. After outlining the possible tasks and subsequent methods to engage with, one of them will be chosen to be investigated in this project.

6.1   Task 1: Designing the information architecture

When designing the TonePrint community, it's important to consider the structure of the information, better known as information architecture. The purpose of this is to ensure that the design accommodates the users' mental model in terms of being a closer match to the conceptual model of the system. This would ease the use of the system, as the system would act accordingly to the users' expectations. As explained in Chapter 4, TC Electronic haven't acquired information about their users understanding of the TonePrint application before, which makes this task even more important. two ways of approaching this will be addressed.

One approach could be to involve the users early on while designing the system by letting them take part in shaping the concept and flow of the community. This is also referred to as a *participatory design procedure* (Clemensen et al. 2017). During this, the users are provided a chance of influencing the design of a future product for example by conducting workshops with them as participants. In the case of the TonePrint community, these workshops could for example be set up with multiple steps focusing on different aspects of the information architecture. This could include a brainstorming session for creating conceptual ideas for the community, a card sorting task where these ideas are grouped,

and a session for creating prototypes from these groups. Another approach also focusing on the information architecture could be to test the current thoughts and ideas of how the application should be structured through prototype testing. prototyping comes to mind in this context, either in the the shape of low-fidelity or high-fidelity prototypes (Norman 2013, p. 228). These are used to test the functionality of an application, even though a finished version of the product isn't available. For low-fidelity prototypes, these mock-ups are instead constructed from easy accessible materials without spending much time on the aesthetic appearance, while high-fidelity are closer to a finished product. For the TonePrint community, lo-fi prototyping can be employed to indicate how the functionalities and features shall be shaped, early on, through user tests with the information architecture in focus. This makes lo-fi prototyping very useful to employ, however, they require a rough idea of how the system should work and how the information is going to presented before conducting the actual test. When brainstorming possible methods for testing with lo-fi prototypes, *the cognitive walkthrough* comes to mind as a suitable suggestion (Wilson 2014). Through this method, the subjects are given a number of tasks to complete on the prototype, where each task has a well defined action sequence necessary to follow step-by-step, in order complete the task correctly. The subjects' results are then analysed through general principles of cognitive psychology in order to locate potential pitfalls in the design.

For either of the tasks above, some planning and preparation is necessary. firstly in the case of constructing lo-fi prototypes, the necessary materials are needed to create a fitting representation. For a participatory design workshop, there are some materials required depending on the sessions in the workshop, but in general, generic elements such as post-it notes for the brainstorming session are needed. The subjects required for participating, whatever the approach, need to account for the possible end-users of the TonePrint community, which means musician familiar with the TonePrint concept. Other groups could also be represented, depending on the scope of the study. If it's of interest, TonePrint users could be employed in comparison with sound engineers or maybe even novices. The process of acquiring the subjects can be eased with the help of TC Electronic themselves though their existing online communities. For the cognitive walkthrough the subjects don't necessarily require the same level of background knowledge, as it can be conducted with novices and experts alike, depending on the chosen approach (Wilson 2014). As such, the members of the development teams at TC Electronic could also be used as subjects for the test.

From personal experience of previous semester projects utilizing some of these methods, fitting them to a 3-week sprint is considered fairly doable. As already mentioned, the methods require some planning, and with an employee dedicated to this phase, the appropriate amount of time can be applied to it. Figure 6.1 illustrates a graphical proposal to how it can fit to the SCRUM framework, where each sprint is divided into weekly intervals. Each of these weeks focuses on the different parts of conducting user studies, *planning*, *execution*, and *analysis*. As it appears from the figure, it's furthermore

proposed to combine the analysis phase for one sprint with a *pre-planning* phase for the next. This is not intended to add further workload to an already important phase of the sprint, but the employee dedicated to conducting the studies would benefit from making some early thoughts of the sprint to come, easing the actual planning phase. This is especially considered beneficial, if the individual sprints represent minor user tests contributing to one overall scope. By the end of each sprint, the results of the test are presented to the rest of the development team during *sprint demos* similarly to the other members.
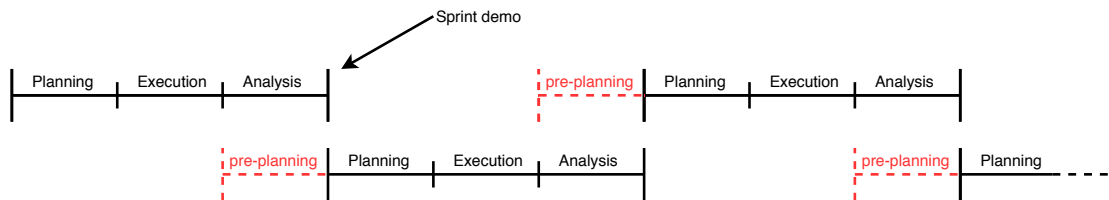
Figure 6.1: An illustration of how to fit minor user studies to the SCRUM framework. Each sprint period is split into weekly intervals with the final week also functioning as a pre-planning phase for the next sprint.

6.2   Task 2: Tags

A new feature for the TonePrint community is *tagging*, which was a prominent topic during the interview, see section 4.1. Aiding the users in categorising and in general getting a better overview of the potentially many User TonePrints is considered important by TC, and proposals should therefore be made to a study with this in focus. Choosing an approach for this requires some clarification to what the baseline is, as the study either can start from existing sorting metrics such as *genre* and *effect type*, or it can start completely from scratch, focusing on more subjective tags. In the case of starting with existing tags in focus, the task is to derive these, which can be done by either engaging in interviews with the users of the current TonePrint app, or data can be gathered through a survey. Each of these approaches has their benefits, but when it comes to fitting them to sprints, there is a clear benefit from surveys, as they can be taken remotely by the users, eliminating the need of recruiting subjects for face-to-face interviews.

In the case of starting from scratch, some further considerations should be made. Subjective tags may aid the subjects in personalising the sorting metrics of their TonePrints, but to what extend should the tags be subjective, and should there as such be a limit to how freely the users can tag their TonePrints? The motivation for these questions lies in the assumption that tagging with no constraints to it might make it difficult for other users to understand the intentions with the TonePrint in question.

Investigating this involves a testing method that can be used to identify and quantify perceptual attributes for the vast amount of different TonePrints, and one such method could be the *descriptive analysis* (Martin and Bech 2005). This method starts by se-

lecting a panel of relevant subjects, approximately 10-15 people, and in the case of the TonePrint tags, this would be users of the TonePrint app. The first phase of this method involves them generating attributes, describing TonePrints, which also is referred to as a *word elicitation* (Martin and Bech 2005, pp. 6-7). The subjects start this by generating individual lists of words, generally describing TonePrints, before they group these in a panel effort. The created groups are then given a fitting title and two end points, forming attribute scales (Martin and Bech 2005, pp. 7-9).

With a set of attributes and scales created, the next step of the method is then to test these scales, looking for potential redundancy, consistency, unidimensionality, and correlation to physical measures (Martin and Bech 2005, p. 10). As a result for the case with TonePrints, the method will not only produce relevant attributes used for tags, it may also be applied to produce scales for each of these tags. This means that if utilized intentionally for the TonePrint community, this method will produce a set of tags, and the users will furthermore have the option of declaring to which degree these tags then fit their TonePrints.

Considering the multiple steps involved in a descriptive analysis, it seems evident that executing it requires more than one sprint cycle. The aim should therefore be to split the method into separate sprints, dedicating one to recruiting subjects and conducting a word elicitation, another for creating scales and setting up an actual test, and a third for conducting this and analysing the results. It could also be necessary to set this up differently, depending on the availability of participants and the amount of stimuli to test the attribute scales on.

6.3   Task 3: Self-promoting functionalities

A prominent new feature in the TonePrint community is the users' ability to promote themselves similarly to how the professional guitarists and bassists are promoted in the current TonePrint app. A task could therefore be dedicated to investigate, how the users would like this to be shaped. A starting point could be to investigate what already exist, similar to this, as a way of seeking inspiration. From personal experience, what first come to mind is the online audio distribution platform called *SoundCloud*, where aspiring and major musicians, alike, of all genres can upload, promote, and share audio. Another source of inspiration, brought up by subject 4 during the interview, is a platform called *Soundmondo*. This platform is dedicated to Yamaha keyboards, where a user can create a sound and then upload it to the system as a QR-code, making downloading it easy for other users. This quote was coded as a part of the *inspiration from external products* category (see Figure 4.1).

Whatever the source of inspiration, a study could be set up with the intention of looking at how other platforms within the realm of audiosharing allows their users to promote themselves. The feature could then be designed on the basis of what works good for these other platforms, before testing it with the TonePrint users. This, however, also requires a version of the community more down the line, where some elements of the platform

already have been specified and designed. The focus could also take a step back and start by investigating the need for self-promoting functionalities in general. If the users in reality just want the option of sharing their TonePrints through a "share button" or as a link, similar to the Soundmondo example, then the whole matter of self-promoting is less important.

Engaging with this task requires an exploratory approach, as the intention is to acquire new knowledge of the users. With the example of investigating existing products, the approach could involve observational studies of the users interacting with the existing products. The challenge with this will however then be to compare the results with the TonePrint users, as they may not be the same people. The observations could still be made though, as TC themselves also presented it as beneficial to explore other products, during the interview (see section 4.1). A design proposal should then be made from the results and tested with the TonePrint users' understanding and expectations.

Determining how to fit this to the SCRUM framework is however more difficult. The task first of all requires research on the existing platforms to draw inspiration from, which may take some time. The systems found should then be explored in an observational study, in order to come up with a design proposal for the feature in the TonePrint community. This should then be tested with the TonePrint users. As it already has been mentioned, this task lies a bit further down the road for TC, as it requires a more or less functioning version of the TonePrint community.

6.4   Task 4: GUI of the App

From the name of this task, it seems as the scope of it is the same as that of task 1, but this is not the case. Task 1 aims to approach the design of the information architecture from scratch, either by conducting user tests on specific design proposals or by approaching it as a *participatory design phase* with much user involvement. The scope of this task moves beyond just the information architecture, as it can concern any aspects of the functionality and aesthetics of the GUI. As students of engineering psychology, such a task could easily resemble that of a typical semester project, and an approach could be to conduct user tests on existing products in the realm of TonePrint in order to produce design proposals for the TonePrint community.

At this point, TC Electronic don't conduct user tests to the extend of UX professionals dedicated solely to it, but it is a field, they are interested in exploring further. Design proposals are currently decided upon by the graphical designers in the firm, and a way of involving users could be to either confirm or reject these proposals through an A/B test scenario (Norman 2013, p. 224). In this, different design proposals are scientifically tested, comparing them to each other by measuring the effects of different assignments on the users' behaviour. the two variables A and B usually consists of a currently used version and another version modified in correlation with what the focus of the test is. The differences between the designs should be small and concern specific elements, as

the method is particularly valuable when there isn't a vast number of variables. As an example, the method could be applied to the TonePrint app by testing a part of the interface that has been modified in an alternate version where the rest of the interface remains unchanged. If the scope of the test is concerning an evaluation of the entire system, either as a stand-alone evaluation or in comparison with a re-designed version, methods are also applicable for this approach, even though a comparison of two versions with multiple variables is considered risky. The UX professional needs to have a clear idea of what is wanted from the test, and if the scope of interest for example is an evaluation of the system's overall usability, the *System Usability Scale (SUS)* comes to mind as an applicable method. This is a quick and dirty, reliable tool that consists of 10 questions, intended to uncover the system's usability through a somewhat complex scoring system (Sauro 2011). The resulting score can nevertheless be evaluated by itself or in comparison with the SUS score from a modified system.

In the well planned scenario, conducting such a user test should be easy, as it isn't considered time-consuming if all the variables are understood and decided upon. Depending on the state of the design process, it can either be conducted as a low-fidelity or a high-fidelity test. For the A/B test, it would be preferable to conduct the test at an early stage with a lo-fi approach, as the specifications for the design elements still might be up for discussion. In order to best manage the variables in the test, TC should consider focusing on individual elements and test them one at a time. This would furthermore be a good way of applying it to the Scrum framework, and as such follow a pattern similar to example presented on Figure 6.1. In a hypothetical scenario, the graphical designers and programmers at TC could spend a sprint on designing and implementing a functionality, which then would be the focus of a user test in the following sprint. A UX professional could then spend the first week planning, how they best uncover the important aspect from the user, spend the second week executing this, and during the analysis of the final week, they could already begin planning the scope of the user test for the following sprint.The developers would simultaneously be working on implementing the next feature, and this would make the argument for the UX professionals to participate in the daily scrum meetings to the same extend as the developers. The UX professional would get a look into what they are working on and as such be able to think ahead for the next sprint.

Conducting such a test may require the involvement of the developers, as they implement the functionalities that may be in focus in the test. a UX professional should discuss with them, what they want to uncover from the test and then apply this knowledge. In the case of simply being interested in usability, the UX professional would then recruit subjects and have them conduct tasks with the new functionality in focus. The following evaluation could then simply be the subjects filling out a SUS. In the case of an A/B test, the new version tested against the current system needs to be on a similar level of complexity, in order to make them comparable. Depending on the experimental design, a number of subjects would then be instructed to complete tasks on one or both of the

systems, uncovering their experience through different measurements and questioning.

Preparing prototypes could also be done by the UX professionals themselves as a part of the planning process, but it depends on the purpose of the study. Lo-fi prototypes are, as already mentioned, typically made in the form of paper mock-ups, and having the developers produce these seems a bit irrelevant. The UX professionals could also engage with creating more complex prototypes themselves, as communicating their intention onto the prototype themselves remove the need of having to explain it to someone else and then have them make it.

6.5   Task 5: Defining the user groups

The purpose of this task is to ease the process of designing and developing the TonePrint community by getting a better understanding of who the users are. By having a clear understanding of the users, it's easier to get the design right, faster, and it will require fewer individual user studies. If the developers can make decisions from simply asking themselves "how would the users react and perform to this feature?" much time and resources can be spared on recruiting subjects and conducting user tests (Dam and Siang 2019). From this description, the ideal approach seems to be constructing *personas* of the typical TonePrint users. In general, personas serve as archetypes of the users who you can turn to when asking the previously mentioned question of "how would person X react and perform to this feature?" instead of designing these features by the preferences of the design team. For this description, the approach developed by L. Nielsen (2013) is emphasised as a preferable way of creating personas. She proposes 10 steps for this, going from collecting data on the users to finding patterns and developing the actual personas, before defining the need of the persona and disseminating this knowledge to the members of the development team. The 10 steps are obviously more comprehensive than just presented here and elaborated on in more details by L. Nielsen herself (L. Nielsen 2013, p. 9). Her recipe is however not the only way of creating personas, as this general topic has existed since the late 1990s. in literature on personas there are today four other approaches to engage with. L. Nielsen elaborates on these herself, but they can also found from a simple web search (Dam and Siang 2019). They are as followed:

1. **Goal-directed Personas**
2. **Role-based Personas**
3. **Engaging Personas**
4. **Fictional Personas**

The goal-directed personas intends to uncover what the typical user wants to do with a system in question by examining their workflow while trying to complete an objective with the system. By understanding the goals of the users, it's easier to fit the necessary requirements within the system to make these objectives easy to perform for the users. The role-based personas should also be considered goal-directed but focuses more on behaviour by examining the user's role in a wider perspective. For example by under-

standing where the product will be used and what the purpose of the user's role is, it can help the design team make better design decisions for the product. The engaging persona method is a way of getting more engaged with the users, as the method employs both a goal and role-directed approach. Typically, a 3D rendering of the user is created from this method, which will make the developers more likely to consider them during the design process, their emotions, and their psychological background. Finally, the fictional personas don't emerge from user research but instead from the experience of the UX design team. Based on past interactions with the user base, the team makes assumptions of what users look like. This can be debated as a flawed approach, but it does allow for considerations of the user's needs at an early stage (L. Nielsen 2013, p. 11).

Having these personas seems as an ideal guideline for making design decisions for the system in question, however, constructing these personas isn't something done easily over a 3-week sprint period. The process includes multiple steps of first finding the users, collecting data on the their patterns within different user groups and then describing and validating these findings. as such, extensive interview sessions and observational studies of the users interacting with the system in question is required. For this project, this task is therefore considered too extensive for a 2-week period, but for TC's future work on the TonePrint community, a design approach with personas is considered ideal.

As previously mentioned, the personas method requires a lot of data collection, preferably from interviews and observational studies, and while clear-cut explanations of how to create personas exist, this paper also proposes an alternative approach. For all the tasks listed in this section, different proposals have been made on how to engage them with different types of user involvement. besides providing a helping hand in the decision making for the design of the TonePrint community, Each of these proposals also provide individual minor descriptions of the users in the context of the individual user studies. Another approach to defining the user groups could therefore be to gather descriptions of the users through these individual user studies and create the personas on the basis of them. The benefit of such an approach is that the developers could kill two birds with one stone while conducting user studies on different features for the TonePrint community. they would simply gather the needed information from multiple smaller user studies.

Chapter 7

User Study of The TP Community

The tasks presented in chapter 6 serve as proposals for how to include the users as an active part of the design process at TC Electronic in correlation with developing a platform for sharing User TonePrints. The tasks are all considered equally important, but ultimately only one of them is explored in this project due to the restricted timeframe. Through discussions with our company supervisor, task 1 is chosen for this purpose. The following chapter will start with an elaboration on this decision before moving on to the execution and subsequent analysis of the results, including what methods are applied for both parts.

7.1 Deciding on a task

As described in section 6.1, the purpose of task 1 is to investigate how to design the information architecture of the TonePrint community, in order to ensure that the design accommodates to the users' mental model of the system. Many considerations were put in to the decision of conducting this task, including TC's wishes, how well it would fit into a typical SCRUM sprint, the remaining timeframe for this project etc. The impact of all these factors also influenced what methods to consider and how to approach them.

Firstly, an investigation of the information architecture seemed the most fitting to conduct due to the current state of the TonePrint community. TC are at a very early stage of development, as no version of a sharing platform currently exist. TC therefore considered it evident to start with an assessment of how content and features should be structured as a baseline for the future design process.

Secondly, previous investigations in this project have showed how TC follows the SCRUM framework in the shape of 3-week sprints (see chapter 4). As such, much of the discussion was on finding a task and suitable method that could easily fit to this timeframe, and task 1 was here considered ideal. the limited time remaining on the project furthermore required to conduct it as a 2-week sprint, and even though this is not the same duration as a sprint at TC, conducting a task in this timeframe will still provide insight into how UX tests can fit to a short time period. Task 3 and 4 could just as well fit this timeframe, but each of them require an existing app to some extend.

It wouldn't necessarily have to be a fully functional system, but still one that could represent the appearance and functionalities of the system.

Thirdly, task 5 focusing on creating personas of the typical users of TC products was considered very valuable for TC in their understanding of them. However, this task is too extensive and time-consuming to execute in a 2-week sprint and is in general considered a semester project on its own. If it were to be executed anyway, it would only result in demographical info on the users, which doesn't provide anything new for TC.

When choosing task 1, further specifying the approach is required, as it proposes two different ones. One of these is through Lo-fi testing which is a great tool, but as it is elaborated on in section 6.1, it requires a rough idea of how the system should work and how the information should be presented. For the TonePrint community there currently is no rough idea of how it should look, and it would as such make more sense to include the users in shaping the concept and flow of the community from the bottom through a *participatory design procedure*. The approach should then follow the outlined suggestion in section 6.1 by conducting a workshop with potential end-users as subjects in order to FiXme Note! explore their mental models of a TonePrint community. [1]

7.2   Mental Models

Before proposing the experimental design and setup of a workshop, it seems appropriate to first define what is meant by *mental models*, and how they are constructed. In section 1.1 it is mentioned that if the developers have the same understanding of how a given product should look and behave, then the users are more likely to have a pleasant experience. Other factors such as the users' hedonic opinions of the product also play a role, but this was also meant as a quick introduction to the term. In general, mental models are types of conceptual models that resides in people minds, as the name implies. In other words, mental models are the users' understanding of how something works. The definition of a conceptual model is already outlined in chapter 5 as an explanation of how something works, including all concepts in it, and how they relate to each other. For mental models, different people may hold different versions for the same system, and some people may even hold multiple models of the same system, focusing on different aspects of its operation (Norman 2013, p. 26).

When it comes to constructing mental models, Seel (2003) defines three different factors that influence this process. These are the individuals ability to utilise existing models that relate to the matter in question, general observations of the outside world, and explanations from other people (Seel 2003, pp. 68-69). It should be noted that the "existing models" can be both internal and external models of similar systems, as long as they can serve as analogies for the model to be created. When this is put into context with the TonePrint community, it is as such expected that the users will construct mental models on the basis of:

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[1] FiXme Note: Research question?

- Their understanding of how the current TonePrint app works, including TC's influence on this understanding.
- Observations of how other users utilise the TonePrint app and currently attempt to share User TonePrints with each other.
- What other end-users i.e. guitarists tell them.

A proper mental model allows the user to predict the outcome of possible actions, even if these actions haven't occurred. In such cases, the cognitive system replaces the stimulus in question with inputs from the mental model, interprets them, and draws a conclusion, further strengthening the mental model for future scenarios (Seel 2003, p. 64). For task 1, it's important to remember that the main goal for uncovering mental models is to do so in correlation with assessing how the information architecture should be shaped. section 6.1 already proposes examples of how this could be approached in short, and a further elaboration is therefore required, which will be provided in the following section.

7.3 Experimental design

Shaping the information architecture of a system requires multiple steps of generating ideas for content and communicating these, before moving on to testing them with the users (Rosenfeld et al. 2015, pp. 356-364). For this task, the first step would as such be to generate ideas for content and features to be included in the TonePrint community, and how they should communicate with each other? Instead of engaging in a phase of generating such ideas, this paper instead suggests to make use of studies already conducted by TC, focusing on the TonePrint community. A study by our company supervisor Andersen (2015), investigates what is required from such a platform, and the result is given in the shape of a list of content which, if included, would make end-users more interested in using the platform (Andersen 2015, p. 35). It's important to note that this content also is produced by the users in a workshop, and by utilizing this information, it will serve as a good starting point. Furthermore, the interview conducted with members of the TC staff previously in this project may also contain suitable content for developing an appropriate strategy for the information architecture.

With the ideas generated, the next step is then to explore the content with the users involved, and a suitable way of approaching this is through the card sorting method. Donna Spencer describes this in her book as *a fairly straightforward tool that helps the developers understand the people they are designing for* (Spencer 2009, p. 6). The method involves users sorting a set of cards into piles of what they find similar either according to predetermined group names, or they can be told to describe the categories themselves after the sort. These are referred to as an *open card sort* and a *closed card sort* respectively. The method is most commonly used for organising, grouping, and labeling elements when the focus is on information architecture (Spencer 2009, p. 10), but this doesn't mean that the information can be structured from this method alone. While card sorting is a great tool for finding out what information belongs together, it doesn't provide answers to how these groupings should interact with each other. Donna Spencer

also elaborates that she typically dosen't employ the method on its own because of the just stated reasons and that further user involvement is required for investigating the information architecture (Spencer 2009, p. 15).

Proceeding from the card sort therefore requires methods looking into how the users will put the groupings into context with each other. Methods applicable for this purpose could be *interviews*, where the users are given clarifying questions, or a *survey* could be sent out to reach more people. Ultimately, it is decided to take a more observational approach by having the users explain how to complete specific tasks within the TonePrint community. Before elaborating on how how to specifically adapt this and the card sort, another important factor should be addressed. The subjects have to consist of potential end-users, as they represent the mental models of the people who are likely to use a finished version of the system on a regular basis. As it was mentioned in section 7.2, constructing a mental model is influenced by a persons ability to utilise existing models, among other things. For a more appropriate mental model, the subjects should therefore have to consist of guitarists and bassists who have some level of experience with using the current TonePrint app.

7.3.1   The card sorting method

With the overall scope in place, a deeper look into how the methods should be adapted is needed. Specifying how to employ the card sorting method is done in multiple steps (Spencer 2009, p. 8), where the first is deciding on what is to be investigated. As this already is clarified, attention can be turned to the next step which focusses on fitting specific elements of the methods. Firstly, the question of whether to conduct an open or closed card sort has already been mentioned, and it really depends on how much information is wanted from it. Open card sorts are generally used more frequently, as they convey much more information than a closed card sort, where the group labels are predetermined (Spencer 2009, p. 82). The open card sort is therefore chosen to not only allow people to group cards but also decide themselves, what label they should have.

The next element focusses on whether to conduct it face-to-face or remote. The two deciding factors here are the diversity of TC's customer base and the limited time for conducting the study. TC have already been established as a world-wide known company with customers ranging from Canada to Australia. As such, it is seen as a great opportunity to gather a more diverse collection of responses by conducting a remote card sort instead of only recruiting subjects geographically available. The limited time of two weeks further supported this idea as a remote study can handle itself if it is set up in a proper program. The obvious counter-argument here is that this limits the subjects to only engage in either the card sort or the subsequent workshop tasks, and while this is true, it's decided to still approach it this way. While the card sort takes care of itself, it is possible to run a workshop in-person with a group of end-users at the same time. The time-frame of the workshop is shortened, and as long as the subjects taking part in either the card sort or workshop all are end-user, the job in the future analysis and discussion of this project is to unify the results from the tests. The main concern would be that if the workshop doesn't use the card sort as a starting point, the subjects won't have the

necessary tools to complete the tasks, but since they are end-users, they are expected to know the necessary concepts.

The next step before sending the remote card sort to the subjects is the obvious task of choosing content and finding the best way of reaching the correct subjects. As it has already been mentioned, the cards for the card sort are developed from a TC study (Andersen 2015) and the interview with the four members of TC's development team (see chapter 4), but before formulating them, some considerations should be made to the number of cards. By consulting Donna Spencer, the number should be somewhere between 30 and 100 cards, as fewer than 30 cards may make it difficult to create groups and more than 100 cards might make it too tiring to sort. Nielsen norman group also has opinions to this with a range limited to 40-80 cards (Sherwin 2018). 40 cards are ultimately formulated, each representing a piece of content for the TonePrint community, and during this phase it's important to formulate the content similarly enough to suggest potential groupings while not unnecessarily influencing the card sort. A common mistake when formulating cards is mixing content with functionality, however, in many cases it is possible to rephrase the cards so they are presented at a similar level (Spencer 2009, pp. 103-107).

The card sort is sent to the users as a link in the Facebook group *TonePrint junkies* consisting of more than 4000 TonePrint users around the world, hoping that it will produce some responses. It's however not alarming, should the number of responses be low. Donna Spencer argues that for studies trying to produce statistically valid conclusion, much attention should be given to recruiting the right amount of participants, but for studies focusing on information architecture this isn't particularly relevant (Spencer 2009, p. 130). Nonetheless, as another motivation for taking part in the card sort, the users are informed that they also will take part in a draw for a free TonePrint pedal, by agreement with TC. This is done by providing their email in a short survey following the card sort, where they also get a chance to explain the reasoning behind their created groups, as a way of gathering some qualitative data from the card sort. This survey and the 40 cards are all located in appendix?? [2]

7.3.2 Workshop approach

With the card sort and workshop completely separated, the general run-time of the workshop is substantially shortened, which should ease recruiting, as the subjects are needed for a shorter period of time. The desired outcome of the workshop is to elicit end-users' mental models of the TonePrint community, but this is not how it should be phrased to the subjects, as this definition is to broad and likely won't make much sense to the them. The mental models should be explored in correlation with the new content that is being added to the current TonePrint concept, and the phrasing should therefore focus on this new content, including how the subjects would want to engage with it. On the basis of the interview with the developers at TC (see chapter 2), it's clear that the new content overall consists of sharing User TonePrints with other users and downloading

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[2]FiXme Note: Smid cards i appendix + survey'en

User TonePrints made by others. What is included within this content is investigated with the card sort, but the workshop may also shed some light on this matter. Two tasks are subsequently formulated from this, and they are as followed:

Task 1:
Find a TonePrint made by a user, you are already following, called User 1. This TonePrint must be for your Corona Chorus pedal, because you know that User 1 has uploaded some of the coolest Chorus effects.

Task 2:
You are about to upload a TonePrint, you've made, which means that it must include a name, a description, and some tags describing your TonePrint. After this, you have to share it with one of your friends through the system.

By the beginning of the workshop, the subjects are then informed that the purpose is to have them explain how to complete two tasks with a TonePrint community from their own understanding and expectation. Some considerations should though be made to the setup of this, including how they should communicate their response, whether they should complete the tasks alone or in groups, and how much introduction they should get. The first matter relates to what the best way is for expressing mental models. A simple approach for this is to have the subjects draw their solution on a piece of paper, but they could also be given more extensive tools on a computer.

Deciding on this is done on the basis of a paper studying how students' erroneous mental models about groundwater will change for the better, when their instructions are based on a mental model-building strategy that focuses on clarifying the students' misunderstandings (Reinfried 2006). This paper found that the best ways for changing the mental models of these students into valid concepts was by using a more hands-on mental model-building approach, compared to students just instructed in a traditional way through lecturing (Reinfried 2006, p. 57). This knowledge is utilized in the workshop by confirming that a hands-on approach for eliciting the mental models of the subjects in general is required, compared to just have them explain their thoughts through methods such as the think aloud method. The simple approach of just utilizing pen and paper is then chosen as this hands-on method due to its familiarity. Utilizing a software solution would require the subjects to also learn how to interact with it, unnecessarily moving mental load away from solving the tasks.

The approach, however, requires further specifications, as such visual communication can be done in many ways. it's important to remember that it is done in relation to describing the information architecture of a TonePrint community, and the typical ways of diagramming for this is through sitemaps and wireframes (Rosenfeld et al. 2015, p. 392). The subjects are however not instructed to build the entire platform but merely visualise their understanding of how to complete specific tasks with it. A more fitting approach therefore seems to be having them draw *concept maps* (T. E. Johnson and O'Connor 2008, p. 113). In this approach, the subjects are told to draw their response with two basic

elements: *Content components* and *connections between content components*, describing how the components are linked through actions (Rosenfeld et al. 2015, p. 393). An example of such mapping is displayed on Figure 7.1, where it should be noted that the subjects are free to name the content, components and actions themselves. While this approach seems fairly straightforward, the challenge lies in understanding the drawings afterwards if the subjects all have approached it differently. Currently no standard visual language for describing information architecture exists, and by having the subjects explain their intention after completing the task, the risk of misunderstanding them is reduced. It's therefore chosen to have them explain their drawings afterwards while video-recording them. A consent form for this purpose is included in appendix?? [3].   FiXme Note!
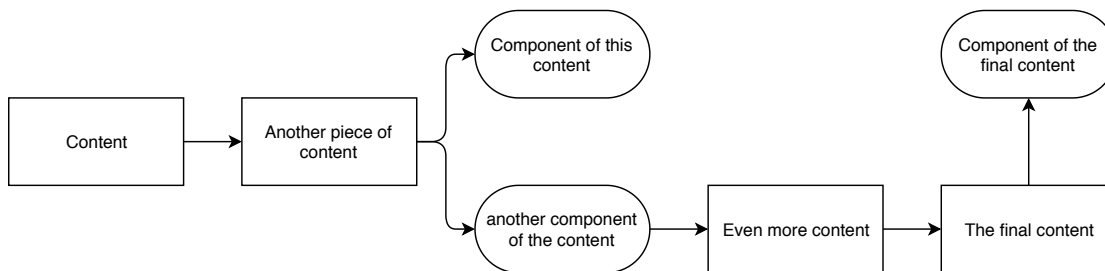
Figure 7.1: An example of a concept map displaying relations between different content and components, with arrows illustrating the flow of actions.

This leads to the important matter of whether the recruited subjects should complete the task individually or in a group. For creative processes in general it isn't possible to say that one of the approaches objectively is more effective than the other, as people are different. Some think best by themselves, while doodling on a piece of paper, and others require the group setting to think more creatively (Rosenfeld et al. 2015, p. 362). On the basis of this, it seems difficult to assume that one of the approaches fits better to the workshop than the other. It's therefore decided to conduct task 1 individually and task 2 as a group task, accommodating for the different type of people participating. This, however, also requires measures for making sure that the subject actively engage in this group session and don't hold back. The workshop is therefore initiated with an "ice-breaker" in order to make it more relaxed. It's assumed that by laughing together early on, they will be more keen to criticise bad ideas later on.

7.4 Analysis method

Analysing this user study is split into two parts, as the card sort and workshop are conducted separately. It's however still the intention to unify them in the end and as such reach a single conclusion. This conclusion must answer the question stated in the previous mentioned research question for this user study. [4]. For the card sort there are   FiXme Note!

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[3]FiXme Note: samtykkeerklæring i appendix
[4]FiXme Note: Indsæt research question og henvis herfra

two overall ways of approaching the analysis, exploratory and statistical. The choice of either must support the goal of the card sort, which has an exploratory approach. As such, it seems obvious to also conduct an exploratory analysis of the data, but in reality both are applicable. Should the amount of data turn out to be small, Spencer (2009) would recommend to just use the exploratory analysis, and in the case of much data, she recommends to start with the exploratory analysis and move to statistical, if it would provide further insight (Spencer 2009, p. 177).

With the exploratory analysis, the goal in this analysis is to find patterns within the groupings that makes sense in correlation with studying the information architecture. More specific, this means answering questions such as:

- What groups do the subjects form?
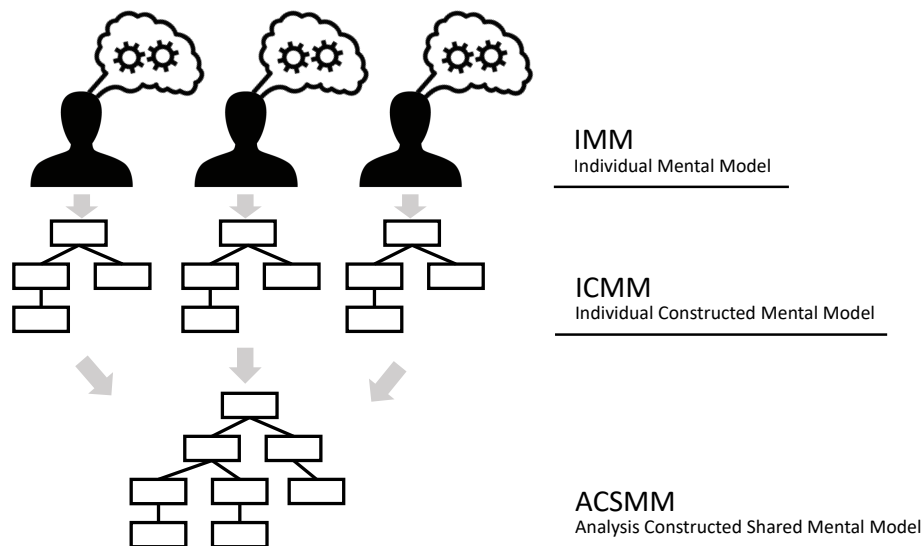- Which cards are typically grouped together?
- how do they label these groups?

The first step of the analysis is to gather the results in a spreadsheet in order to get a better overview of the data. The next step is then to standardise the labels. The subjects may use similar labels for their groups, and the question in these cases is, whether they actually mean the same thing. Gaining an overview of this can be tricky, as the similarity can be in either language or idea, and it therefore requires a thorough look at, not only the label name, but also at similarity in groupings. Subjects may group items together and label them differently, even though the idea may be the same (Spencer 2009, p. 184). When choosing a standardised label name, it is then necessary to use the most prevalent labels. After this phase, the objective then is to examine the groups. This process is eased by presenting the data in a big matrix, making the groupings more clear. The potential tendencies in these groupings will then indicate whether the subjects understand the content similarly and have similar expectations (Spencer 2009, p. 191). This process can also be supplemented by the reverse approach, looking at what is different, and as such getting a broader look at the data. The whole process may be further aided by also looking at any comments given by the subjects. As it has already been mentioned, the card sort is followed by a survey giving them a chance to elaborate on their reasoning, and these comments can therefore be investigated to provide clarifications if necessary.

For the workshop, it's of interest to explore, whether the subjects have similar or different mental models for solving task 1. What content do they include in their explanations, In what order do they present this content, and which actions are required? T. E. Johnson and O'Connor (2008) proposes a method for such analysis that involves combining individual mental models into a shared mental model. In this approach, a somewhat mutual consensus is required of how to construct the individual mental models. Otherwise it will be hard to make comparisons and furthermore difficult for the subjects, if they're confused of how the other subjects are completing the task. The purpose of this analysis is however not to evaluate how well the users work together but generate mental models for the information architecture. The shared mental model should be understood as the

result of combining different mental models, and with the process of constructing it kept in mind, T. E. Johnson and O'Connor (2008) also refers to it as an *analysis constructed shared mental model (ACSMM)*.

Figure 7.2 illustrates simplistically how this model is constructed from the individual mental models. The first step of this process is to have the subjects communicate their individual models, which is done in the shape of concept maps (see subsection 7.3.2). The models are then analysed in order to construct the shared model, and this analysis is done from a combination of their concept maps and the video recordings of their explanations. Their presentations are therefore coded with the intention of easing the comparison phase. The shared model is then constructed by finding the items shared by the subjects from a sharedness criterion of 50%. This means that if the concepts, actions etc. appear more than half of the time, they are included (T. E. Johnson and O'Connor 2008, p. 128).

IMM
Individual Mental Model

ICMM
Individual Constructed Mental Model

ACSMM
Analysis Constructed Shared Mental Model

Figure 7.2: The process of constructing a shared mental model from a group of individual mental models.

The challenge with applying this method, however, lies in if the subjects produce concept maps with substantial differences. If there is no mutual consensus to how they should complete the task, they may use different approaches, making a comparison difficult. The subjects are given the same instructions to the workshop, but if their visual representations of the solutions simply take different routes, then the analysis should be approached more cautiously. The intention will nevertheless be to find common traits for the responses given in task 1, but it may not be possible to completely outline a shared mental model. For task 2, this issue is meanwhile not present, as it involves the subjects agreeing on a response. The analysis of this is therefore more straightforward, as the shared mental model is made from the session itself.

7.4.1 Pilot workshop

Before exploring the results of the user study, it should be noted that a pilot workshop was conducted at AAU with five subjects in order to explore whether changes should be made before conducting the actual workshop. The five subjects weren't TonePrint users but still guitarists, and as such, they were given a short introduction to the TonePrint concept before the workshop was initiated. The pilot workshop went intentionally and produced a few corrections for the introductions given to the subjects in the actual workshop. It was decided to elaborate further to the subjects what they could include in their concept maps, including further specifying the definition of content, components and actions. This also included telling the subjects that they're allowed to include drawings in their concept maps, if this will help them communicate their response.

Discussions were also had on whether to re-phrase the tasks, because the subjects in the pilot workshop had some problems with fully understanding their meaning. It was however chosen to not make changes to the phrasing, as these problems regarded their understanding of the TonePrint concept. The true workshop was set to involve end-user i.e. guitarists already familiar with the TonePrint concept, so this was expected to not be an issue with them. Another change was instead made to the presentation of the tasks. The subjects in the pilot were presented an example of how to make a concept map, but while completing it, they didn't have this visual cue. It was therefore decide to include an example of a concept map next to the tasks in the presentation.

Chapter 8

Card Sort Analysis

There are two overall branches of analyzing the results from a card sort experiment, Exploratory or Statistical and in some cases both are used, to extract as much information as possible from experiment. The type of analysis is largely dependent on the goals of the experiment. The goal for the card sort conducted in this study have been to explore the general idea of how the users of the TonePrint system group concepts of the TonePrint sharing platform. This both includes which kind of groups they create and which concepts they find to belong together. The sample size of the data is also a factor when analyzing the data, because it may be difficult to derive meaningful statistics from a small sample size.

For the card sort conducted in this study 17 have opened the online test whereas few have started and left and One have completed half of it, but only Six have completed the card sort. Only the Six complete data sets are included in the analysis.

8.1   Summary of Results

Six subjects have completed the card sort from which all were male aging from 26 to 44 years old with an average at 34.7 years, and they all come from different countries. Through the card sort the subject have constructed a combined total of 32 groups of varying sizes which may be seen in Table 8.2.

Before starting the analysis it's desired to create an overview of how the individual cards have been sorted. This is done in a spreadsheet (Lav billag og referere til det) containing all the cards in one column with the names of the groups it's placed in the adjacent columns. The next step as described by Spencer (2009, p. 184) when conducting an exploratory analysis is to standardize labels for the groups. This is done by looking at the groups seen in Table 8.2 and look for names that are close to similar or represent the same idea. The purpose of this is to make it easier to compare the groups a card belongs. The standardized labels which is found for this card sort are listed in Table 8.1. Choosing the standardized labels is a balance because it at one hand is a great tool for comparing the data and on the other hand it may result in uniting groups where the subjects have had different thoughts. The *Forum* group were found to draw many simmilarities to the

Community	Search	TonePrints	Pedals
Community	Finding TonePrints	Tone Prints	Pedals
Forum	TonePrint Search	TonePrints	Products
Community			
TonePrint Sharing/Community			
Profile			
Personal Profile			
User Profile			

Table 8.1: The Standardized labels are seen in the top row, with the groups belonging to each seen below

other *Community* labels and is was therefore given the same label Table 8.1[1].

Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
Sharing (29)	Customer service (3)	Tone Prints (24)	Community (6)	User feedback (6)	Very Important (14)
Community (8)	Social (6)	Pedals (7)	Products (3)	User Profile (8)	Somewhat Important (9)
Support (3)	Toneprint software (9)	Subscribtion (3)	Artists (4)	Tecnical aspect (7)	Neutral (12)
Hardware/ Tools (1)	Finding TonePrints (16)	Forum (9)	Download & Tools (5)	TonePrint search (11)	Somewhat Unimportant (5)
Creating/ Editing (2)	User Settings (6)		TonePrints (11)	TonePrnt sharing / community (11)	Very Unimportant (3)
	Ratings (3)		Personal Profile (7)		
			User Feed (7)		

Table 8.2: The column shows the groups a subjects has created and how many cards the group consist of

8.2 Group Analysis

At the first phase of the analysis it's desired to analyze the groups created by the subjects. The scope is to explore what kind of groups the subjects think of, when presented for

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[1]FiXme Note: Tabellen skal opdateres

the cards provided for this card sort and how similar and different the subjects thinks. One of the first thing that becomes clear is that one subject is have created created groups very differently than the other five subject. Subject 6 has chosen to group the cards accordingly to how important he think it is. Even though there may be derived some interesting findings from subjects 6's groups they aren't found comparable with with the groups created by the other subject. After looking for tendencies in the other subjects groups, it might be possible to compare the trends to with what Subject 6 finds interesting. When looking at the remaining subjects there seams to be several similarities. One theme that may be reflected by the groups is "social interaction and social media". This is clear by most of the subject making a *community* group while the *Social* group draws similarities to different community groups. Having this alongside two *Profile* groups and *User settings* it seams like the idea of a sharing platform share bonds with that of having one's own place in it. [2]

There also is different aspects groups allocated to "Finding TonePrints" where the *Search* and the *Pedal* groups draws many similarities by mainly focusing on library and filter cards. Here the *Search* is also focusing on other features for finding a Toneprint e.g 'TonePrint Description', 'Tags describing a TonePrint' and 'Searching system'.

Another theme that has different takes is that of "Feedback". The *User Feedback* group focus on different aspects of feedback options, whereas half of the group consists of the identical groups *Support* and *Customer Service* which refer to communication options with TC and artists.

For the *Technical Aspect* group there is a generally scope of "functionalities that the app should be able to do concerning individual TonePrints". Five of the cards in this group is the same thous which *Download & Tools* is based on, and by adding to more to it there group *TonePrint Software* is formed. Narrowing it down the group *Creating / Editing* may be located, which only focus on the concepts of adjusting parameter setting by yourself or giving your friends the chance. Also the *Hardware / Tool* group is present and is only consisting of the 'Beaming tool' card.

The *Subscription* group and the *Artist* group are both small and are concentrated mainly on the cards in which the name of the groups are present. However is there in each group a card that seam misplaced, because it doesn't seam to have any relation to the others, which is more likely to happen for larger groups.

The remaining groups are the two *TonePrints* groups and the *Sharing* group. The two large groups consists of more than half of the cards each and is therefore difficult to interpret by them self and their content, because it varies a lot. This also seams to be the case with the smaller *TonePrints* group, which might have been used as a group for cards the subject felt difficult to group.

As mentioned is the groups formed by Subject 6 very different than those created by the other subject because he has grouped the cards in order of how important he think they are. This actually gives the interesting opportunity to look for tendencies regarding what he think is important and the groups which already have been explored. When

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[2]FiXme Note: Få noget med UserFeed in her

looking at the *Very Important* group it's clear that it's focused on functionalities that by it's own would be an TonePrint app that works fine. There is only two cards in this group that also appears in a community group, whereas one of them only is placed there by a single subject and the other by two. This indicates that Subject 6 doesn't seams to find the community aspect Very important. The groups which appears most in the *Very Important* groups is the *Search* groups and the *TonePrint Software* and *Technical Aspects* groups, whiteout counting the two large groups that often appears because of their wide description.

For the *Somewhat Important* there is a bit more mix of which groups that appears. Almost half of the group is related to the *Search* groups while the rest is a bit mixed, however does several *Community* and other "Social interaction" groups appear.

The most frequent groups found in *Neutral* is the community related groups, and when looking at the cards this group is based on it's generally is functionalities and concepts that generally describes a profile based sharing platform. There is one card that seams odd compared to the others, which is the 'Beaming Tool'. This card have more in common with the cards in the *Very Important* in terms of function.

The *Somewhat Unimportant* group consists of "Filter" cards and cards that regarding "information about or from other users". Four of the five cards is directly concerned with other users.

The things that Subject 6 finds *Very Unimportant* is all related to *Community* groups. The cards are *Link to other social media profiles, "Other TonePrint users near you" suggestions* and *Comment section.*

8.3 Card Analysis

When analyzing the results of a card sort it's not only interesting to look at the groups created and named by the individual users, but also to look at how frequent some cards are grouped together. For this purpose the data from Subject 6 has been excluded because he have grouped them so fundamentally different. When looking at the frequency of cards grouped together a distance matrix is created. Each row of the distance matrix represents a card and the same goes for each column, creating a half matrix where each cell compare two different cards, resulting in each card being compared to one another. For every time two cards have been grouped together the 1 is added to the cell value, which in our case have the cells varying between the values 5 to 0. When looking at which cards that always or often is grouped together it's possible to get an general idea of which natural groups that exist in the cards without being interpreted on a basis of label an other cards in a the larger groups.

When looking at which cards that always is grouped together, seven groups is identified. The seven groups that of cards that always appears are seen in Table 8.3. As seen by the labels does each of the groups describe different functionalities, whereas some still have similarities e.g. the to Search related groups. However, the two groups that are closets to appear in together is the **TonePrint Related search** and **Popularity of TonePrint**.

These groups doesn't seams to have much in common, however when looking at the groups these cards appear in, it's only one subject that doesn't place them in the same group. Here it's seen that subject 5 have placed the the **Popularity of TonePrints** cards in his category *Community* and the **TonePrint related search** cards in his *Search* group. This is a good indication of how the small sample size affects the analysis of the the card sort, because there one subjects changes might have a huge impact on the end result.

Personal input	Social Media	Feedback with Feedback	Pedal related search
User biography	Link to other social media profiles	Feedback from users to TC Electronic	'Effect type' Filter
Description of personal equipment	Public forum	Feedback from TC Electronic to users	'Pedal type' Filter
			Pedal Library
TonePrint related search	**Popularity of TonePrint**	**Upload / Download**	
Tags describing a TonePrint	"Other users also liked this" recommendation	Automatic cloud upload	
Toneprint description	'Rating' Filter	Toneprint upload system	
TonePrint categories	'Popularity' filter	Toneprint download system	
TonePrint library		Automatic cloud download	

Table 8.3: Cards always grouped together

8.4 Use of Card sort data

As mentioned earlier is the results of the card sort heavily affected by a very small sample size. One of the reasons for conducting the card sort online was to make it easier to reach real users and many, while planing and conducting a workshop. This limits the possibilities of collecting qualitative data about the reasoning behind the groups created by the individual subjects. The limitations of gathering qualitative data makes the analysis more reliant on the qualitative aspects of the data, which is problematic to interpret while have a very small sample size.

What can be derived from the analysis section 8.2 is that the subjects mainly agree on dividing the cards in groups focused on Social interaction like that of social media, in which users have a profile. Groups focused on finding TonePrints which may be done by

filtering a search in different libraries. There also appear groups focusing on communication in the form of feedback either to or from TC electronic and Professional artists. A group that also is seen is focus on having having somewhat basic functionalities for a TonePrint sharing platform that enables uploading, downloading and parameter adjusting. these tendencies is also to some extend apparent when Subject 4 and 5 put words to how they grouped the content.

8.4.1 Lesson learned

Clearly hasn't this card sort been a success. The small sample size and the inclusion of very large groups have hindered interpretation of the groups created between subjects. The groups in which the cards are paired every time might give some indications, however when moving one layer out there is many groups that get entangled. Having not fulfilled the purpose of the card sort a new one might be conducted. This time it would it may be beneficial to conduct it in person, even though it might be difficult to find a large sample size of real users. On the other hand would the amount of qualitative data probably outweigh the sample size problem, or the "Realness" necessary for subjects.

Chapter 9

Workshop results

As it is elaborated on in chapter 7, the purpose of the card sort and workshop is to elicit mental models of the users' interaction with a TonePrint community platform. In the workshop this is investigated for two specific tasks, which on their own don't provide a full explanation for how the entire information architecture should be. The given tasks are the overall new features going from the current TonePrint app to a TonePrint community, and the results are as such also overall explanations. For further elaborating explanations, the various elements in each task should be investigated on their own as a set of subtasks. The subjects' mental models are derived from their hand drawn concept maps and subsequent explanations of them, which was video recorded, and the purpose of the following chapter is to present the results of this workshop before uniting them with the results of the card sort.

9.1 The individual task

The workshop was conducted in a meeting room at TC Electronic's headquarters in Aarhus, and five members of their staff served as subjects for this. It's important to note that none of them have been affiliated with either the development or maintenance of the TonePrint application at any point, so they were considered fitting subjects for the workshop. The obvious bias of including developers of the TonePrint app would have meant that the workshop wouldn't have produced mental models representing those of the end-users. One of the subjects, however, was considered a potential bias as he develops templates for User TonePrints. He has not had any influence on the design of the TonePrint app though, so he was included in the individual task any way but instead served as an observer for the group task, leaving the remaining four subjects for this.

For the individual task, the results produced five different hand drawn concept maps, these are all found in Appendix E. The results for the subjects are presented individually including their concept map, depicted with software to make it more presentable and readable, a table of their highlighted content and actions, and codings of their video presentations. For the depicting of the concept maps it was considered insufficient to create a complete remake of their drawings alone, as they differ greatly in terms of

structure and detail. In order to balance these differences, the new concept maps are made from their presentation of their drawings. The major pieces of content such as sites, list etc. are depicted in rectangles, while the components within this content, such as search, filtering etc. are depicted in rounded rectangles. The connections and actions between these elements are depicted as pointers. The codings of their explanations are presented with the concept map with the important content and actions highlighted with **bold text**. This is done to put the content and actions into context and not only have them displayed in a table.

Subject 1

Subject 1 starts from the **TonePrint app** where he wants to **Log in** in case he isn't already. Then he enters his **my TonePrints site** which contains a tab either called **friends**, **community** or something more fitting. He presses this tab and is redirected to either a **search friends** functionality or simply a **friends list**. The two could also be combined to include the search functionality within the friends list. He uses the search functionality by writing **user 1**, so it is the only name in the list, and by pressing the username he enters his **profile**. On this profile he is presented a **list of TonePrints** created by user 1. The list is divided into the tabs **by name** and **by type**. From the list of types, he selects the **Corona TonePrints** and under this he wants to select **Warm Corona**. This selection could either be confirmed by an **add to my list** option or a button with a gear symbol on it, even though he's not completely sure what would happen by pressing it. Instead he proposes pressing the name of the TonePrint which would unveil a heart, giving him the choice of **liking** the TonePrint. It would also present him with instructions in the shape of **about**, **how i use it**, and **number of users**.

Content and Components	Actions
TonePrint app	Logging in
My TonePrints site	Pressing friends/community tab
Friends/Community tab	Writing "user 1"
Search functionality	Pressing user 1 name
Friends list	Filter by type
User 1 profile	Selecting Warm Corona
List of TonePrints	Pressing "add to my TonePrints"
Type and name filter	Pressing like functionality
Corona TonePrints	
Warm Corona	
Like functionality	
About this TonePrint	
How i use this TonePrint	
Number of users	

Table 9.1: The important content, components, and actions mentioned by subject 1
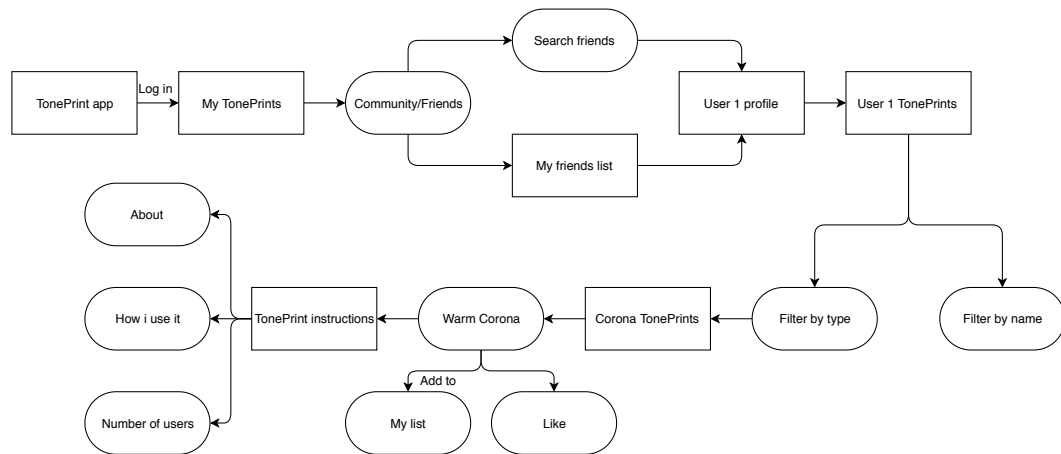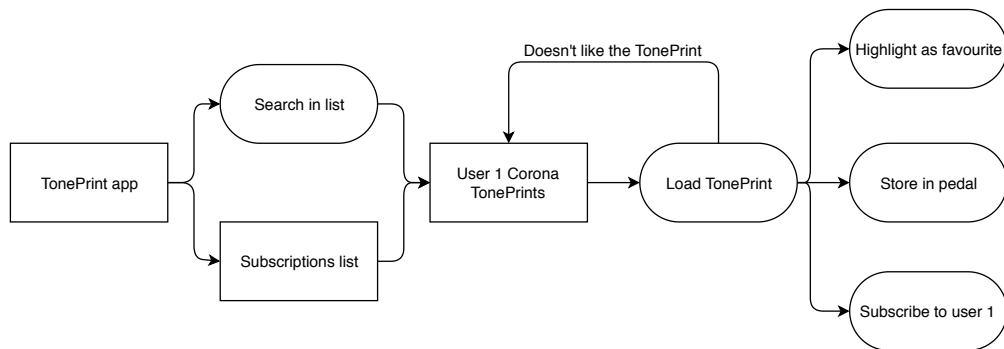
Figure 9.1: The concept map for subject 1. The hand-drawn map is displayed in Figure E.1.

Subject 2

Subject 2 starts by opening the **TonePrint app**, after this he has two options. The user can either open his list of **subscriptions**, if he's looking for a user that he already has subscribed to, or he can open another **list** and simply **search** for user 1. Whatever the approach, the next step is then to hook up a pedal and guitar, and select one of **user 1's Corona TonePrints**. He selects one of them and **Loads it to his pedal**. Subject 2 then tries out the TonePrint by playing the guitar, and if doesn't like it, he goes back and selects a new TonePrint. If he does like the TonePrint, he wants to **highlight** it as one of his **favourites**, so he can find it at another time. He would also like to **store it in his pedal**. Finally, by selecting to subscribe to the user, he would expect the system to send him **notifications**, when the user uploads **new TonePrints**, either directly in the app or maybe by mail. When all these steps are clear, subject 2 would then expect to unhook the pedal from the app and start playing with the TonePrint in question.

Content and Components	Actions
TonePrint app	Looking through "subscribed to" users
Subscriptions list	Searching for user 1
Search list	Hook up pedal and guitar
User 1 Corona TonePrints list	Selecting a user 1 TonePrint
Favourites list	Loading TonePrint to pedal
Notifications of new TonePrints	Trying out the TonePrint
	Highlight as favourite
	Storing TonePrint in pedal
	Unhook pedal from the app

Table 9.2: The important content, components, and actions mentioned by subject 2
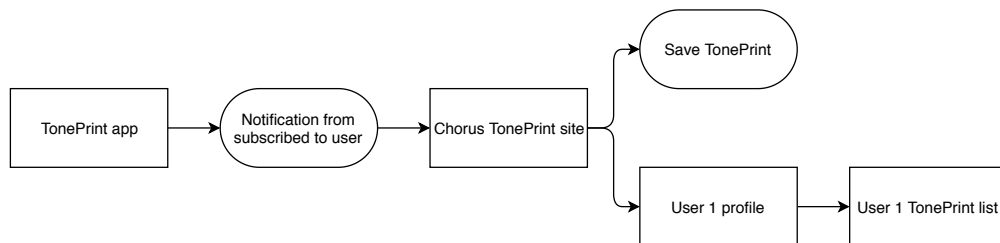
Figure 9.2: The concept map for subject 2. The hand-drawn map is displayed in Figure E.2.

Subject 3

Subject 3 starts by opening the **TonePrint app** and gets a **notification** telling him that user 1, who he already **subscribes** to, has uploaded a new **Chorus TonePrint**. He tabs this notification, sending him directly to the specific **Chorus TonePrint site**, where he selects **save TonePrint**. From here he can then go to **user 1's profile** where he can check out other **TonePrints made by user 1**. He expects these to be sorted in a **logical order** such as **alphabetically** or something more fitting.

Content and Components	Actions
TonePrint app	pressing notification
Notification system	Saving TonePrint
Chorus TonePrints	pressing user 1's profile name
Chorus TonePrint site	
User 1 profile	
User 1 TonePrint list	
Alphabetical sorting	

**Table 9.3:** The important content, components, and and actions mentioned by subject 3

Figure 9.3: The concept map for subject 3. The hand-drawn map is displayed in Figure E.3.

Subject 4

Subject 4 starts by opening the **TonePrint app** which he expects to have the same infrastructure as the current TonePrint app. He then navigates to **User TonePrints** where he expects to find all of his own TonePrints as well as an option called **cloud library**. By selecting this, he is redirected to where **all user TonePrints** are stored, and he wants find a TonePrint from a user that he already knows. He expects there to be a **filtering system** of some sort, and he chooses to **filter by product**, presenting him with a list of all **cloud based Corona TonePrints**. Subject 4 would then like to **search** for user 1, redirecting the list to the Corona TonePrints made by user 1. An alternative approach would be to just search for user 1 in the first place and be presented for all **user 1 TonePrints**. He considers this a more direct approach, as it only requires one action, but by using the current infrastructure of the TonePrint app, he would expect the filtering system to be a part of the solution. Subject 4 then enters **User 1's profile**, where he is presented the TonePrints of user 1, although just the Corona types given the filtering system. He then clicks on a TonePrint with the intention of **trying it out in real time**, indicating that he wants to **transfer the TonePrint to his pedal**. If he then likes it, he can choose to **save it to his own library** and **highlight it as a favourite**. He wants an interface like the current TonePrint app, where he can **Save the TonePrint** and **Store it in pedal**.

Content and Components	Actions
TonePrint app	Selecting cloud library
User TonePrints	Filter by product
Cloud library	Searching for user 1
List of all user TonePrints	Clicking on a Corona TonePrint
Filtering system	Trying TonePrint in real time
Cloud based Corona TonePrints	Transfering TonePrint to pedal
Search functionality	Saving TonePrint to his own library
User 1 Corona TonePrints	Highlighting TonePrint as a favourite
All user 1 TonePrints	Saving the TonePrint
User 1 profile	Store TonePrint in pedal

Table 9.4: The important content, components, and actions mentioned by subject 4
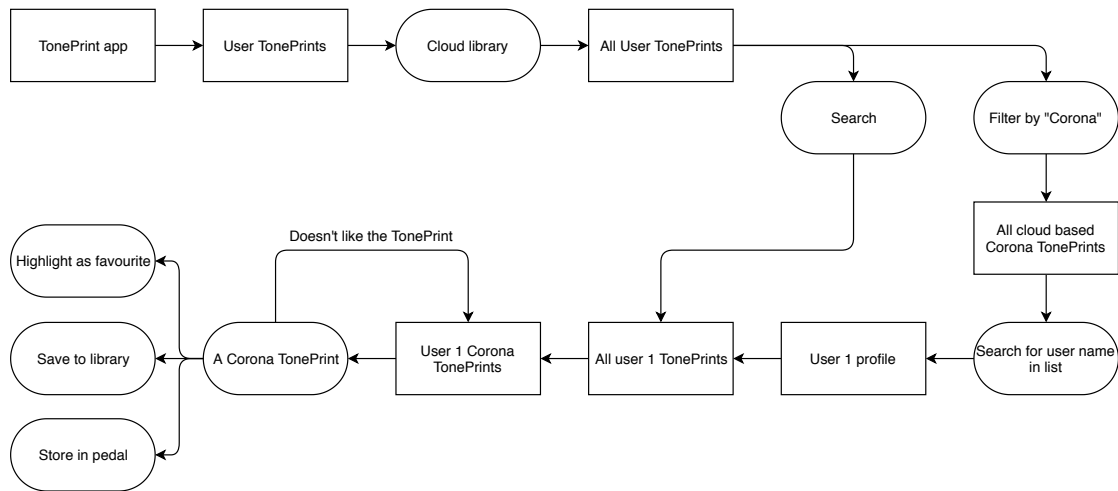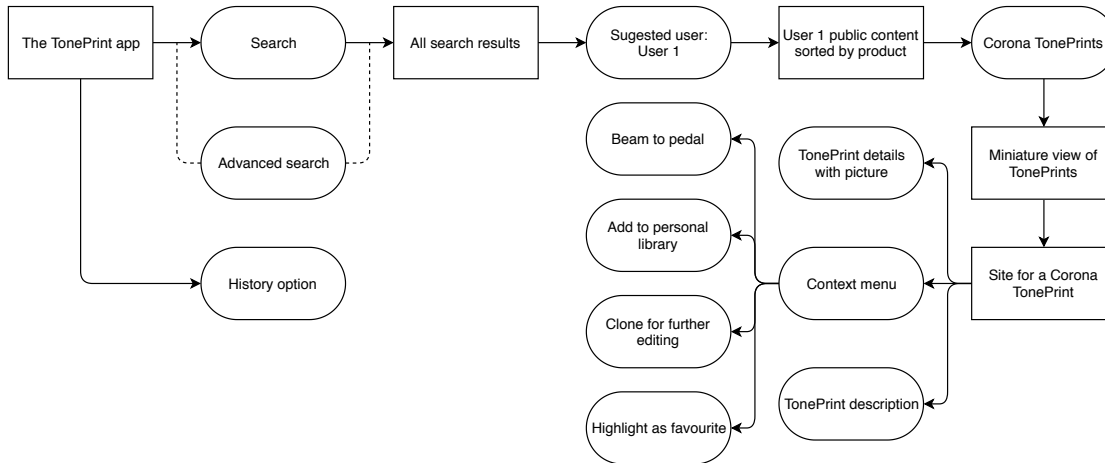
Figure 9.4: The concept map for subject 4. The hand-drawn map is displayed in Figure E.4.

Subject 5

Subject 5 starts by saying it needs to feel as familiar as possible, **similar to other apps** such as Youtube. Everyone uses these, and they tend to be somewhat similar. In the **TonePrint app** he therefore imagines a **magnifying glass icon** in the corner for **searching**, and he further proposes an **advanced search** for personalising the search. In either case, he proposes that it should work as a **meta search option**, where everything fitting to the search criteria within the system is presented to the user. In order to present this more organised, he proposes **different icons representing different content**. In the case of searching for user 1, the system would then provide a **suggested user: user 1**. By pressing this, the user is then redirected to all the **public content for user 1**, **sorted by products**. From here, he selects **Corona TonePrints** which unveils a **miniature view** of all user 1's TonePrints for this product, and when selecting one of these, the user is presented a site with all the **TonePrint details** and maybe a **picture** attached to the description. Should he just right click on it or hold a finger on it on the smartphone version, he would see a **context menu** with the options: **Beam**, **clone**, or **add to personal library**, allowing him to **edit it** or **highlight it as a favourite**. Finally, he describes a **history functionality** which allows him to **backtrack his actions**, much like in a web browser. As such, he will be able to find a TonePrint, even if he didn't highlight it as a favourite

Content and Components	Actions
Similar to other apps	Pressing magnifying glass
TonePrint app	Searching for user 1
Magnifying glass icon	Pressing suggest user: User 1
Search functionality	Selecting Corona TonePrints
Advanced search	Selecting a specific TonePrint
Meta search	Right clicking / holding a TonePrint
Different icons for different content	adding to personal library
Suggested user: User 1	Further editing the TonePrint
Public content for user 1	Highlighting as favourite
Corona TonePrints	Backtracking his actions
Miniature view	
TonePrint details	
Picture with the description	
Context menu	
Beaming option	
Clone option	
Add to personal library	
Favourite option	
Edit option	
History functionality	

Table 9.5: The important content, components, and actions mentioned by subject 5

Figure 9.5: The concept map for subject 5. The hand-drawn map is displayed in Figure E.5.

9.2   Reflecting on the task results

Before investigating the results of the group task, it seems fitting to first take a look at the results of the individual task in order to find common traits between the subjects. Had the workshop provided no major differences between them, then it would seem more or less straightforward, how the design of the information architecture should be approached, but this is not the case. It's also important to note that only 5 potential end-users participated as subjects in the workshop, and conducting more workshops with more subjects could just as well provide other results. All the subjects start the same way by opening the TonePrint app, with subject 4 even stating that he would expect to start from the current TonePrint app with the same infrastructure. They weren't instructed to approach the task on the basis of the current TonePrint app and the TonePrint community as one unit, but this might be due to bias from the task example. The route they then chose to reach the TonePrint made by user 1 turned out be rather different. Subject 1 and 4 propose they start by entering their own site of User TonePrints, where they have a tab giving them access to the public User TonePrints. subject 1 refers to this as *friends* and *community*, while subject 4 refers to it as *cloud library*. For subject 2 and 5 it seems as the current app and community are completely unified, as they jump straight to a search functionality with subject 2 also proposing to enter a list of users that he already subscribes to. Subject 3 has the fastest route to the TonePrint of them all. He also proposes a subscription system, but in his version he receives a notification of a new TonePrint by user 1 that redirects him straight to it, skipping a lot of steps included by the other subjects.

Subject 1 and 4 then proposes a search functionality as well. Subject 4 first want to filter the vast amount of TonePrints by product, but both of them, as well as subject 2 and 5, wants to write "user1" and press the search result. This points towards that a search functionality should be included, even though it's not completely clear how the action itself and subsequent search results should be presented, and how advanced it should be. From the search there also seems to be some difference to where the subjects then expect to be redirected to. Subject 2, 4, and 5 expects to be taking directly to a list of all the TonePrints for user 1, with subject 5 referring to it as all the public content for user 1. Subject 1 expects to be taken to a profile for user 1, and this concept of a profile is present for more subjects, but he is the only one expecting to be taken to it at this point. In reality, all except subject 2 mentions a profile at some point during their presentation, and this would imply that profiles should in some way be a part of the TonePrint community. When reaching the correct TonePrint, the subjects generally have the same idea of what to do next. all subjects except subject 3 wants to highlight it as a favourite, and subject 1, 4, and 5 also wants to save or add it to their own TonePrint library while subject 2 and 4 talks about storing the TonePrint to the pedal. Subject 2 and 4 furthermore want to play with the TonePrint in real time before deciding on whether to save it or not. As final remarks, the subjects also proposed content for the TonePrint community such as backtracking, editing options for saved User TonePrints, and instructions for the TonePrints, including how to use them and their number of users.

9.3 Group task result

For the second part of the workshop, the subjects were given a new task and told to produce one answer for it by reaching a common consensus instead of giving individual responses. As it has already been mentioned in the introduction for this chapter, subject 4 was excluded for this part, as he was considered a potential bias. Instead he observed the remaining subjects solving the task by his own request. The subjects were video recorded, as they engaged in a discussion of how to solve each step they found necessary in order to reach the end goal. The intention with this was to obtain a more reflective answer, as the subjects also needed to convince others of their proposes.

The overall task was to upload a User TonePrint to the community, including the necessary meta data describing it, and from their point of view, the current way of setting parameters and naming a TonePrint should also be the way of doing it with the community integrated. The subjects then agreed that the need for descriptions and tags depended on whether the user in question wants to share the TonePrint with others. If the user only wants it for his own enjoyment, he should be able to simply skip the phase of describing and tagging it, but if he do wants to share it, the descriptions and tags are considered important. The distinction between a text description and tags was a heavily debated theme during the task, as the subjects considered the purpose of each somewhat similar. Both elements provide other users with info of the TonePrints in question, and one of the subjects even proposed including tags within the text description, maybe in the shape of hashtags, so they are clearly highlighted. The text description should nevertheless be something that the users write themselves, and one of the subjects also proposed to let the users include pictures with these.

The discussion then turned to how the design of the tagging system should be approached. They proposed that after writing a description for a TonePrint, the system should present a list of 'suggested tags'. These tags should be generated by the system itself, either from the parameter settings alone or also from the text description, and they should focus on different aspects of the TonePrint such as genre, effect type, craziness, etc. The intention with the 'craziness' tags would be to inform the user whether parameters have been set to extreme levels. It was also proposed that the suggested tags could be automatically applied by the system, while another subject wanted the suggested tags to appear in a drop-down menu. Finally, they also proposed the option of creating custom tags if the suggested ones weren't considered sufficient by the users.

After tagging, they then discussed how the sharing action should be done. The initial proposal was to simply highlight a TonePrint as 'public' but this wouldn't support the wish for also making more private sharing available. This lead to a discussion of how TonePrints could be shared with e.g. fellow band members by Facebook or mail, while not having it as a public TonePrint. one subject then proposed a solution similar to the smartphone app, snapchat, where it is possible to send content to either individual friends or groups of friends, although this probably isn't be the best analogy due to the content disappearing after being viewed. All this lead to three possible outcomes for sharing

TonePrints. Firstly, the TonePrint could be kept private and therefore unavailable to other users of the community. The subjects referred to this as 'Unlisted' meaning it can only be found and accessed by the creator. Secondly, the creator could also choose to allow acces to a few people, if he decides to share it with them. Finally, he could just list it as public and allow access to anyone. In this scenario, the TonePrint would appear when searching matching criteria.

Presentation of group task

Just as with the individual task, the presentation of the concept map from the group task is also coded to highlight the important content, components, and actions. The group starts on the **page** of a **TonePrint** that they have just created. The first thing they do is **naming it** after which they are met by a **scheme** where they can **write a description** in their own words of TonePrint. They can also **upload a picture** of the band, the setup, or something else more descriptive. After this they are redirected to **suggested tags** based on **genre**, **effect type**, **sub-types** of the effect type, or a **craziness factor** if any parameters are set extremely high. After this, they are redirected to a **free tagging session**, where it is possible to include all the custom tags that they believe also describes the TonePrint. after this, they **save their changes** and are redirect to **privacy settings**. Here they can choose to make it **private**, so it's only available to oneself, they can set it as **unlisted**, making it private but shareable, or they can set it as **public**, making it visible to all. For both of the last two options, they can send it directly to their friends

Content and Components	Actions
TonePrint page	Naming it
Description scheme	Writing a description
Suggested tags	Uploading a picture
Genre	Choosing suggested tags
Effect type	Setting custom tags
Sub-types	Saving changes
Craziness factor	Choosing privacy settings
Free tagging session	Spam my friends
Privacy settings	
Private	
Unlisted	
Public	

Table 9.6: The important content, components, and and actions from the group task

66
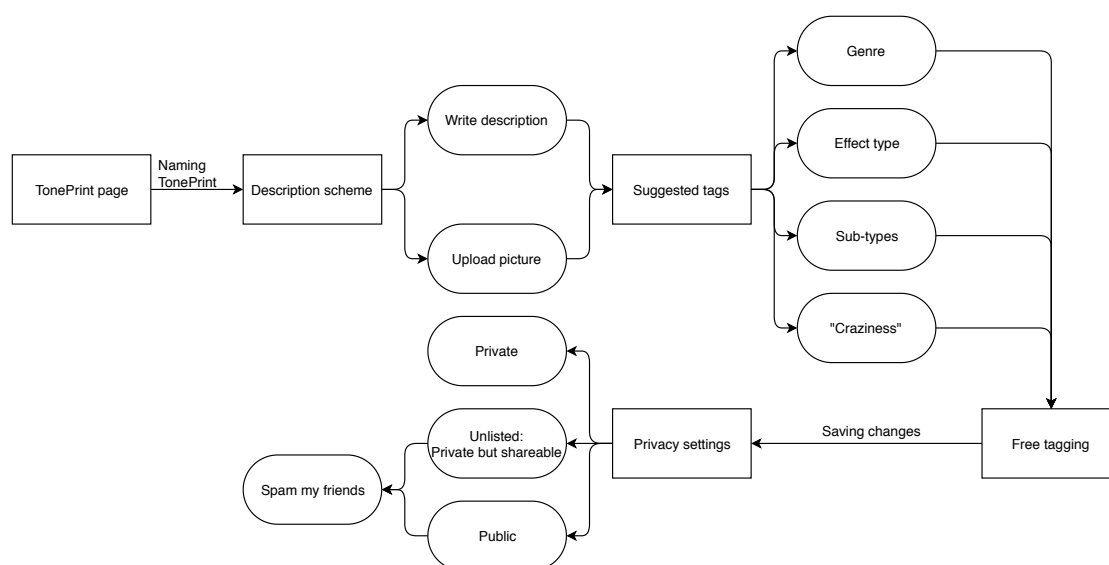
Figure 9.6: The concept map for the group task. The hand-drawn map is displayed in Figure E.6.

Chapter 10

Discussion

The following chapter intends to discuss the results of the user study in correlation with comparing the results of the workshop and the card sort. Through this discussion it will be reflected upon how the findings might be used in the design process of the TonePrint sharing platform. Furthermore it would be discussed how this study leads to further studies. In the end the intention is to discuss the entire project in by comparing the research questions in (Research questions).

10.1 Comparing the results

As described in chapter 7 is the scope of this user study to explore the users mental model of the TonePrint sharing platform. Which is an important aspect of designing the information architecture. In this pursue, two methods is used separately in order to explore how users group the concepts and functionalities of the platform and how they work together in order use the platform. In a perfect world could the results from this study indicate which content and concepts that should be present in different sites, in order to accommodate the users journey to complete a task. However isn't the world always perfect and the results might be to divers in order to be able to decide on a finished IA yet.

Comparing card sort and individual results

When looking at section 8.4, section 9.2 and section 9.3 is it very clear that the success of the two methods are very different. The results of the card is badly affected by the small sample size and lac of qualitative data, whereas the workshop provided a fair amount of data both from the individuals models which to some extend could be compared, and the discussion when agreeing on a model.

The scope of the individual task in the workshop was that the subjects had to find a TonePrint created by a fictional user. When comparing this task with the results of

the card sort the starting point would be to look at the look at the groups focusing on "Finding TonePrints" and the cards representing the concepts and components, that the subjects uses in the workshop. Ass seen in section 9.2 and the individual models Figure 9.1 to Figure 9.5 is the first step to either use a search function or filtering in a library or, in order to locate the corona toneprints created by 'User 1'. When looking at cards representing this such as *TonePrint library*, *Searching system* and *'Effect type' filter* it's seen that they are located in the searching groups. For the aspect of filtering and searching on another user is the cards *User library* and *'User' filter* the best representatives whereas only the filter is seen as a searching tool. Bother of these is however grouped as a 'user feed' or 'User Profile', which is concepts that in some way also appears in the workshop results. There has not been provided cards that describes the use other users toneprints or in other ways is directly comparable with the aspects to which the 'User 1 profile' is used to find a 'User 1 corona TonePrint'. However does the two 'Profile', the 'User setting' and 'User feed' groups indicate that there should be some sort of user profile incorporated in the sharing platform. After locating the target TonePrint identifying it as a favorite is often the next step followed be downloading and beaming the TonePrint. While the *TonePrint download system* and *Beaming* cards are sorted in together identifying as a TonePrint software tools, the Favorite part is more difficult to compare, because no card or group is directly referring to the concept. The cards best most related to this is *"Other users also liked this" recommendations*, *'Rating' filter*, *'Popularity' filter* and *User raring system*. The first three of thees is always grouped together (When excluding subject 6) however is there little consistency in the groups thy are placed in, while the latter cards grouping have nothing in common that of the other. A comparison between the two methods for the part of favoring or rating a TonePrint to far-fetched.

Comparing card sort and group results

The scope of the group task was to have the subjects finding an common ground for which concepts and functionalities that the sharing platform should feature. As seen in section 9.3 did this result in a description of a system whit somewhat well defined features. When looking at these results it's important to remember that the task dictated that when creating the TonePrint it should included a name, decription and tags used for categorizing the TonePrint. How they included and describes these is not hinted at.

When discussing the concept of tags and descriptions it's argued that they are very similar in the sense of describing the TonePrint, in order to make it easier to find. This is also the case of the *TonePrint category*, *Tags describing a TonePrint* and *TonePrint description* cards which have been grouped together every time, belonging to groups either focused on searching or TonePrints in general. *'Effect type' filter* and *'Genre' filter* are cards that also is grouped for searching, which is quite similar to what is suggested in by the group, when suggesting what the tags might be based on. As for the sharing aspect of the group discuss the two concepts, public and private. For the card sort is the

cards *Private forum* and *Public forum* the most similar. These are almost pared by each subject and is grouped in 'Community' groups. This does not indicate that these cards might be related to the concept of sharing one's TonePrint.

General comparison and reflection

Despite the comparisons above is it still important to keep in mind that data this is based on stems from a small number of people. This isn't as much a problem for the workshop, given the type of data, it is a larger problem for the card sort data. However, some tendencies is spotted where groups from the card sort, either by label or cards often paired together, draws similarities towards concepts or ideas generated though the workshop. This indicates that there might be some common ideas of how the concepts works for e.g filtering or tags and that there is some general idea of a profile being a part of the community. This is however just tendencies spotted in a small set of data hinting ad some similarities without statistical evidence.

The idea behind conducting the to studies simultaneously was to gather a large amount of data from the card sort, providing a clear indication of conceptual groups, which then would be compared to the conceptualized mental models from the workshop. It's always easy to be skeptical in retrospect when a study doesn't goes as planed. The card sort could have been conducted in person instead which would have made it possible to gather more qualitative data, but at the same time wouldn't it be able to reach user across the globe. A reason for conducting the card sort remote was also that it could "handle it self", allowing time to be allocated to the workshop and other aspects of the project.

When reflecting on the workshop there's also some perspective worth taking to consideration. The results derived from the individual tasks is based on five users ability to conceptualize and verbalize how they wants to solve a task, using an imaginary system. The number of participants of cause limits how much that might be derived from the workshop alone, however is it still possible to find tendencies with only few subject, when using qualitative methods. When subject conceptualize their mental model based on a task is the findings also limited to the extent of that task. An example from this study is that there seams to be a general idea of the concept of profiles. Because the task denotes that the subjects should locate a TonePrint is the only information derived for the profile that it contains the TonePrints created by that user. This doesn't mean that the users lack a mental model regarding what the profile concept might include, it just indicates that the their mental model of the profile concept tells them it can be used to access that users TonePrints. Instead of using the task focused approach could the subjects just have been told to "Name the concepts you think should be a part of the TonePritn sharing platform, and describe these concepts". By doing that is the task limitations avoided, however could this result in the subjects providing superficial descriptions because they lack a context to base it on. In order to reach the entire extend of the platform more studies should be conducted and even then would it be fare-fetch to state that the entire mental model has been explored, because the mental model.

Compared with the individual tasks the group task provides a more thorough description of the concepts used to complete the task, because the subjects are describing and

discussing their understanding of the concept in order to reach a common consensus in the group. It could be argued that both tasks of the workshop should be conducted as group tasks, in order to get the a more thorough description of the concepts for the first task. However is it also possible that the group task went well because the subjects already ha framed their mindset towards creating concepts and verbalized them through the presentation, which means that each subject in the group task already was in a state of mind that may have affected the group discussion. If another workshop was to be conducted it should be considered to switch the task around, making the upload task individual and having it as the first and the task of finding a TonePrint last, as a group task.

10.2   The mental mode (for now)

The results derived from chapter 8 and chapter 9 have been compared and reflected upon in section 10.1 and now it's time use that information in order to look at *"how the users mental model of the TonePrint Community may be conceptualized, and how this may be accommodated through the design process of the TonePrint community"*[1].

FiXme Note! The TonePrint community should include a searching functionality which enables the user to find TonePrints by searching or filtering in a list by Effect type, name, Creator (Other users), parameters of the TonePrint described as tags and which ever tag ascribed to a TonePrint. There should be user profiles which is accessible though the search functionality. The Profile should include the TonePrints that user have defined as Public and

FiXme Note! maybe some personal remarks and description [2]. The TonePrints should include descriptions that highlight the creators intentions with the TonePrint and maybe describing the

FiXme Note! settings of it[3]. The TonePrint should also include tags that describes the parameters and effect type of the TonePrint, where some of them suggested to the creator based on the TonePrint parameters and description by the system, and some is created entirely by the creator. It should be possible to download the TonePrint to one's own unit and adding it to a favorite list. The TonePrints is either private and can't be accessed by others, it can be "unlisted" which only is accessible for users granted access or it can be public for every to access. A conceptualized model of the TonePrint based on the description above is presented at Figure 10.1.
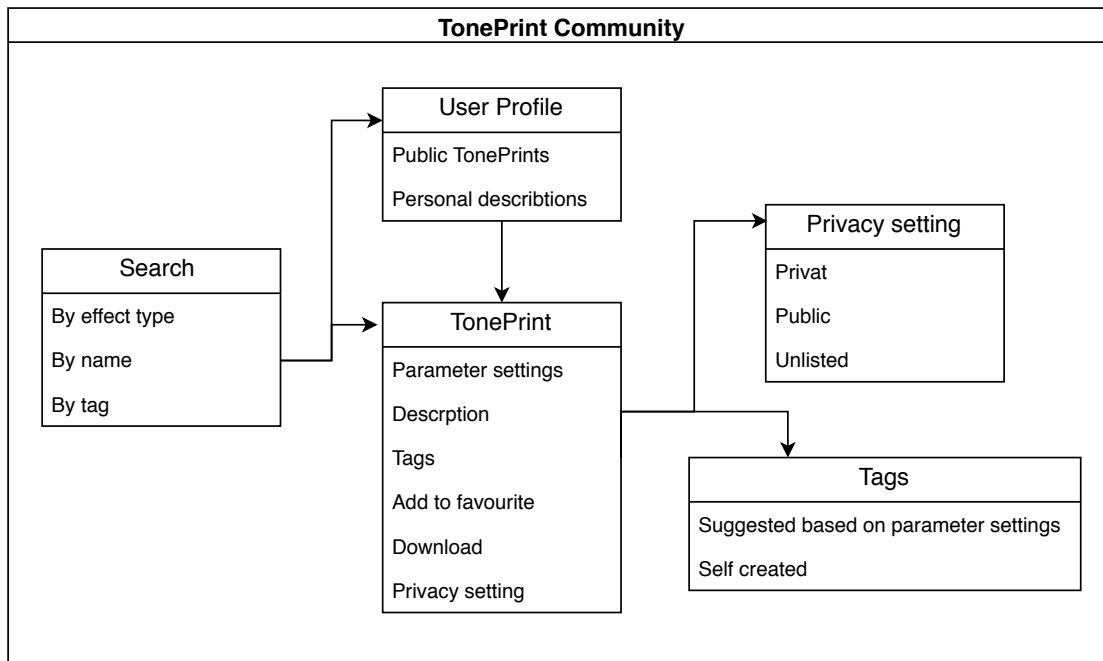
---

[1]FiXme Note: Midlertidig research question for vores user study
[2]FiXme Note: Det er taget fra profile grupperne i card sorten, som måske skal forklares bedre i den analys
[3]FiXme Note: Er ret sikker på at de nævner dette i deres diskussion, men det er ikke noteret i analysen

Figure 10.1: The conceptualized Mental Model

As made clear in section 10.1 does the mental model at Figure 10.1 not depict the entire community with all its concept and content, so to accommodate this new studies should be conducted focusing on both specif concept e.g how tags should be based on the parameters and how they are understood by the users, or specific groupings of content e.g what content should be on the same page and how should i be structured hierarchically. Based on the findings of this study a new card sort could be conducted with with cards representing examples of content that belongs to the concepts seen on (REF TIL BILLEDE). This could be a closed card sort using the concepts as predefined groups. The results would then show to what extent the concepts are understandable. Another approach could be to create a Low-fidelity prototype based on this model, which than could be used to have the users conducting simple tasks exploring how the model derived from this study is interpreted by other users. Both approaches help exploring the understanding of the model in order to elaborate on it and create a design accommodating the mental model.

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Appendix A

TonePrint app usability issues

The content of this appendix is the usability problems defined through the heuristic evaluation of the TonePrint application section 2.2. The problems are listed in accordance with the heuristic it violates. No problems were identified for the "User control and freedom" and "Help users recognise, diagnose, and recover from errors", which is why the two heuristics aren't mentioned below.[1]

Visibility of system status

- When browsing through the available TonePrints for artists, some of them may have created the same TonePrint settings for multiple pedals. Clicking between these doesn't provide any clear feedback to which is selected however, as the description of the TonePrint is the same whichever pedal it is set for.

- There is a lack of indication to which instrument is selected, as this selection happens in settings and not in the list itself. If either *guitar* or *bass* is selected under the instrument filter, and not *all*, the message in the list *"all TonePrints by..."* is misleading, as the user is only going to find TonePrints for one instruments.

- When pressing *user* on the computer application there are no indications of what to do next. The user is just presented a blank column with nothing in it.

- When selecting the **Helix Phaser** with the *guitar* filter active on the computer app, nothing happens. When trying this on the Iphone app, it opens one TonePrint, and when opening it on an android unit, the app crashes.

- When pressing the video icon on the android and computer app, it isn't clear that the unit will open youtube in a web browser compared to the Iphone app.

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[1]FiXme Note: Skal de engelte problemer have en mere fyldsgørende beskrivelse?

- There is no indication of which TonePrint you already have stored in the pedal connected. [2]

Match between systems and the real world

- The sliders for the various parameters are all presented as circular sliders, but interaction with them are done by pressing the center of it and swiping up or down. As such there is a risk of grabbing the entire canvas and not the parameter in question.

- It appears to still be possible to select bass TonePrints with the *guitar* filter active.

Consistency and standards

- Some artists have published the same TonePrint for multiple pedals and when switching between these, the text description is the same. However, in some cases there is a noticeable difference when doing these switch, as some of the descriptions has minor spelling or typeset errors, even though they should be identical.

- When opening a video description of a TonePrint with its creator on the smartphone app, it is presented in a new window. When opening one in the computer app, it passes you on to the given video on youtube.

- When browsing TonePrints, there are different buttons in the top right corner of the description page, depending on on the TonePrint.

- When watching a video description of a TonePrint on the Iphone app and the user at some point wants to return to the list of TonePrints or artists, it demands two different interactions. First, the user must swipe down in order to return to the TonePrint description, before either swiping right or pressing *back* to get back to the list view.

- When choosing the **SpectraComp Bass Compressor** with the *guitar* filter on, the user dosen't get the same menu as when choosing other pedals. This is probably due to it being a bass effect.

- When creating a favourites list, the TonePrints are sorted by pedal name, even if the user selects *sort by artist*.

- When opening the app on an android unit, the user gets informed that he needs a midi connection. This message doesn't appear on the desktop version, even though the same goes for that.

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[2]FiXme Note: Spell check: Jeppe

- The user has a search functionality available on the android system but not on either the desktop or Iphone version.

- After connecting the pedal and setting the app to 'browse by artist', the artists who have a TonePrint applicable for the pedal aren't highlighted. This contradicts what happens if the app is set to Brows by Pedal.

- After you have created your own TonePrint and saved it, it becomes visible in the user menu and three dots to the right of it indicates interaction possibilities. On a mac and as a mac user it's expected that you can swipe on the computer's trackpad, instead of using the three dots, this is however not true in this case. [3]   FiXme Note!

Error prevention

- The typical confirmation dialogue of either ✓ or ✗ is presented to the users with these icons inside the button on the Iphone app. As such it isn't clear whether the user selects an action when it is visible, or if this visibility means that it is already selected.

- When the user is beaming a TonePrint to the pedal, he is given the instruction: *If your pedal flashed like this beaming was a succes*. In order to follow this instruction the user would have to focus on the pedal, and by doing this he wouldn't have seen this instruction in the first place. As such, the user has to focus on two things at once.

- The user can assign different parameters to the same physical button on the pedal, allowing for live editing of the TonePrint. However, the pedal comes with a print above the knob on the pedal itself, which can't change. As such, the user can potentially edit a parameter, even though the knob says something different.

- In the mapping settings of the editor part it's possible to select which parameters the physical buttons of the pedal should affect and map their behavior. When changing the parameters, the mapping of the new parameters is set to a default. If you regret and wants to use the former parameter as it was mapped you would have to remember how it was mapped, because it's also given the default mapping. [4]   FiXme Note!

- Knob range: The indications of what's represented on the x and y axis in the mapping part of the editor is not very clear. The writing is dark blue on a dark blue background.[5]   FiXme Note!

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[3]FiXme Note: Spell check: Jeppe
[4]FiXme Note: Spell check: Jeppe
[5]FiXme Note: Spell check: Jeppe

Recognition rather than recall

- When switching between *browse by product* and *browse by artist*, this has to be done under settings, and the same goes for switching between type of instrument. Instead of having this filtering action visible with the list, the user must remember to check this in the settings menu.

Flexibility and efficiency of use

- In general there are limited ways of customising the canvas, for example the favourite list.

- The search functionality on the android app only allows for searching in the open menu, making it almost redundant. The user still needs to to go to the right menu before searching for specifics, making scrolling a faster way of finding the right TonePrint.

- While browsing the TonePrints in the Library menu or the templates menu you are forced to use the "Back arrow", in the upper left corner, to navigate back to the main page of the menu. This contradicts with the expectations of the menu icons also being applicable for this interaction, which stems from interaction with other systems. [6]

FiXme Note!

Aesthetic and minimalist design

- It's limited to what extend the size of the canvas can be expanded on the computer app. If it is made full-screen it will no long match the size of the window and take all the space. Instead, the far right of the window will just be a blank column of nothing.

- When opening the computer application, until something is chosen, the screen will primarily be just blank.

Help and documentation

- When choosing *Editor Help*, the user is sent to the main TonePrint webpage.

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[6]FiXme Note: Spell check: Jeppe

Appendix B

Interview with TC

This appendix contains the interview guide used for interviewing the members of the development team of the TonePrint app at TCchapter 3. The interview guide is in Danish because the teams members were all danish. At first there is a small introduction which were read to the interviewee, also ensuring their consent to audio record the interview. This is followed by a list of the predefined questions the interview is based on.

Introduction

Formålet med dette interview er, at vi gerne vil have et indblik i jeres udviklingsproces af TonePrint appen, da fokusset for vores projekt er at kigge på, hvordan et fremtidigt TonePrint community kan udvikles. Interviewet kommer til at foregå under et semistruktureret format. Det vil sige, at vi har forberedt nogle spørgsmål, men hvis du har nogle pludselige indskydelser eller ekstra informationer, du tænker vil være relevante, så skal du endelig ikke holde dig tilbage med disse. For at vi kan holde styr på de mange informationer, vi må få ud af interviewet, kunne vi godt tænke os at lydoptage det. I den forbindelse, vil vi selvfølgelig gerne høre, om det er ok med dig? Optagelserne har til formål at hjælpe os videre i processen med vores projekt, og dit navn vil på ingen måde fremgå af vores dokumentation.

- Da i udviklede konceptet for TonePrint appen, hvordan besluttede i hvilke funktioner der skulle være med og hvordan de skulle designes?

- Hvordan har jeres viden angående jeres brugere påvirket udviklingen af TonePrint appen, og hvor har i den viden fra?

- Gjorde i noget for at målrette TonePrint appen mod bestemte brugergrupper, og hvordan gjorde i det i såfald?

- Selvom TonePrint appen er et ret unikt produkt har i så draget inspiration fra andre interne eller eksterne produkter, og i så fald hvordan?

- Hvordan besluttede i jer for informationsstrukturen i TonePrint appen, både set i forhold til menustrukturen og de forskellige måder de kan kategoriseres på?

- I har en meget stor database af både TonePrints, pedaler, kunstnere og videoer. Hvordan besluttede i jer for, hvordan i håndterer og præsenterer de forskellige data?

- Hvilken data vil du mene er nødvendig for at kunne gøre et TonePrint community med User TonePrints effektiv, og hvordan vil du mene denne data skal struktureres og kategoriseres.

- Hvad ligger til grunde for forskellen på appen fra platform til platform? Eksempelvis informationen om ikke tilsluttet pedal, søge funktionen, video visning og TonePrint information samt beaming?

- Hvad er formålet med tekstbeskrivelserne tilhørende de forskellige TonePrints, og hvordan beslutter i jer for, hvad der skal stå?

- Hvilken type feedback får i vedrørende TonePrint editoren, og hvordan bruger i denne feedback?

- Til hvilken grad bruger i informationer, i får gennem TonePrint-junkies-facebooksiden, youtube eller music tribe community?

- Meget har ændret sig op til den nuværende app. Hvorfor ændrede i både den grafiske identitet og flere features?

- Hvilke positive og negative effekter har jeres SCRUM arbejdsmetode haft på udviklingen af TonePrint appen?

- Hvilke teknologiske begrænsninger har i haft under udviklingen af TonePrint editoren, og hvordan har i kompenseret for disse?

- Hvordan opstillede i kravene for TonePrint appen, både konceptuelt og design mæssigt?

- Hvordan opstillede i målsætninger for TonePrint appen? og hvordan sikrede i jer, at disse blev nået?

- Hvis du skulle nævne fem vigtige aspekter som vi bør tage med videre i udviklingen af et TonePrint Community, hvad skulle det så være?

Appendix C

Interview Themes

The following appendix contains the resulting themes from the thematic analysis of the interview with the 4 members of the development team at TC Electronic. Each theme is presented with a brief elaboration of what it covers, and they are presented in chronological order as they came up during the analysis with only a few exceptions. Some themes were formulated during a second iteration by reorganising some of the codes and by renaming some of the theme names in order to better fit the content. The approach and method for the analysis is described in section 3.2. The groups of codes and data extracts that the themes are based on is seen in digital appendix Appendix F. The parenthesizes in the theme names indicate the number of codes the theme is based on.

Beaming app (8)

The focus of this theme is the TonePrint application in its early stage, where the editor wasn't included. Instead, the app only consisted of a library with artists TonePrints that could be filtered by either *guitar* or *bass*. The reason for the label "Beaming App" comes from the four subjects describing the app this way, as beaming already was available through the pickup in the instrument in this early stage. The codes within the theme covers descriptions of different elements of the app, as the first question is interested with the decisions made during the initial design process of the app.

No external inspiration (3)

This is a small theme containing comments from the subjects when they're asked whether they have sought inspiration from any internal or external products during the development of the TonePrint app. And as the name indicates, they generally don't believe that they were inspired by any external ones. However, one of the subjects commented that a sister company had a product with some similarities, but he didn't consider it a source of inspiration.

Development tool (13)

The TonePrint editor and general concept stems from a development tool used by TC Electronic for creating parameter settings in new pedals. This theme is concerned with that tool, referred to as *virtual front*, and originally it wasn't something TC had offered customers, as it was rather complicated and primarily utilized by the sound engineers at TC. It was used to set which parameters that was available for editing in the knobs on the pedals, and it has, as already mentioned, since been developed into a product on its own in the form of the current TonePrint editor.

Parameter design (12)

Given the functionality of TC Electronic's products, the different parameters of the audio settings are set by models described as *meta models*. The meta model is what is altered to define the sound of the given product. A challenge for TC has been to make these models easier to read and understand by the users e.g. how gain is controlled with labels, intervals etc. These models are what the editor is altering, and the underlying challenge for TC is to avoid showing the users all parts of the concept and risk being copied.

Internal hierarchy (7)

This theme deals with the internal structure of the development team, more specifically in correlation with how decisions are made. At some point during the design process, decisions has to be made to reach deadlines, and it was explained by the subjects that the *product manager* has the final saying in these scenarios. This has lead to situations where the developer had to integrate features in the app that he wasn't capable of explaining himself due to high complexity. In other situations, however, the developer was more persistent and managed to get the final saying in how the feature should be designed.

Feature prioritisation (12)

During development of new products, TC have to prioritise which features to include first. All the members of the development team has a saying in this process, but users are also involved in the process, if they have specific feature requests. These requests are gathered from the existing online communities such as *TonePrint Junkies* on Facebook and their own Music Tribe site. When it comes to deciding on which features to implement, two factors play an important role, how easily can it be implemented? and how important is the feature? If a feature is considered important but at the same time time-consuming to implement, other requests may be implemented before it. The TonePrint community is in its own right a request made by many users and is a great example of the just mentioned prioritisation process. It's heavily requested and as such important but also difficult to create. As such, it has since been postponed, while other features have been implemented in the existing TonePrint app.

Decisions made from testing (6)

TC Electronic doesn't have extensive experience with user involvement but have already conducted a few user studies. Some design decisions have been made on the basis of the results in these studies where competitors' products was investigated in order to get into other markets. One example involved a type of pedal, they weren't making themselves at the time. They then decided to study competing products and found that the interface and controls of that pedal were too complicated. They then applied this knowledge to their own pedal which then became more succesfull.

The concept of making the editor available for users, instead of just using it as a development tool, also came from a user study. Here, a group a bass players were given access to the virtual front with the task of creating a new sound for a bass amp, which resulted in a new setting for the TC products. The result of this eye-opener for TC became what is now referred to as the TonePrint editor. Finally, a user workshop was conducted by TC focusing on developing ideas for a TonePrint community (Andersen 2015). This workshop lead to multiple ideas for content and features, but the development of this is still at a conceptual stage.

Experience from earlier products (5)

This theme highlights that TC Electronic utilizes the experience they have gained during the development of some of their earlier products and from their user studies. One example of this is a pedal that turned out to be too complicated and too expensive, and another is the user study on competing products mentioned in the previous theme. This experience has also been present in the development of he TonePrint concept, as they kept it in mind that they had to focus on reducing complexity.

Focus on the target users (9)

There are different kinds of target users for the TonePrint concept in general. Some of them just wants a regular pedal with physical buttons on them for editing the sound, while others have more extensive requests for content and functionalities. Some of them are users of the TonePrint pedals and application because they want to sound like their idol or want to discover new sounds made by professionals, while others wants to make their own TonePrints from the bottom. The requests from these different groups are met in the form of the pedals themselves, the Artist TonePrints, and the TonePrint editor. These groupings of target users are not something that TC have defined through user studies but more from a gut-feeling. Finally, for the TonePrint community, there also is the group of people who wants to share their TonePrint with each other.

Decisions made from assumptions (9)

This theme further emphasises how TC don't have much experience with user involvement. The decisions of which features to include and how to design them are mostly based on assumptions of what they believe the users want and what works best. An

example of this is the design of the interface for the parameter settings in the TonePrint editor. The developers describe how this was shaped accordingly to their own assumptions, with one of them further stating that he would expect it to simply be the typical way of setting it up.

Decisions made from convenience (4)

Here, two situations are mentioned of how convenience played a role in decision-making. An example of this is how they want to implement options such as "link to Youtube" and "like your favourite users" in the TonePrint community through technology that they already possess. Another interesting point made in the interview is that they in some instances have had a tendency to just try out the easier design proposals before discussing what they actually want to achieve from it.

Communication in the development of an app (10)

From the interview it was found that the current level of communication in the development and maintenance of the TonePrint app is insufficient. It was found that the platform-specific differences between the different versions of the app to some extend is caused by a different programmer for each platform. They have a level of "artistic freedom" and they are furthermore seated in different teams. As such they have each implemented features depending on what is commonly used on their given platform and communication between them is complicated due to their different seatings.

Business model (7)

The TonePrint concept enables TC to always upgrade their product by adding new content in the form of new artists and templates. In this theme it's also highlighted how TC wants to separate themselves from their competitors which is why they have conducted user tests of competing product.

TonePrint descriptions (14)

For every TonePrint in the library, there is a text description telling something about the artist and the specific TonePrint. The motivation for what is written in these descriptions typically comes from members of marketing who meet up with the artists in question. The aim for the descriptions is to involve the artists and make the users want to try out the given TonePrint. By providing them, the users have some information about the settings in the TonePrint in question, and this is considered further valuable in a TonePrint community. For professional artists, it may seem more obvious for the users what the artists wanted to achieve. Furthermore, in the case where many TonePrints for the same pedal are made, the descriptions will help the users sort out which ones they want to try. there could easily come alot of TonePrints, where these descriptions can help the users sort out which ones they want to try.

TonePrint Concept (18)

This theme covers comments made on the TonePrint concept in general. The TonePrint concept consists of three layers: Regular pedal adjustment, beaming of Artist TonePrints and templates, and finally the creation of User TonePrints. Each of these layers aims at different target users and helps TC expand the spectrum of possible end-users. Many of the comments are concerned with how TonePrints allow the users to sound more like their idols and as such is a unique product. Other comments also covers their thoughts of including a community for sharing user TonePrints in a future version of the platform and what should be included in this.

UI design specifications (21)

Going from the former TonePrint editor to the current, a lot of the UI was changed. In the early version, many interactions were controlled with sliders, and this was challenging for the UI designers, as there were problems with mapping these sliders to the screen, especially for the phone users. The comments in this theme is concerned with how they made changes to the editor in order to make it more user friendly. A current challenge being discussed is the lack of information at each parameter setting. There is a lack of cues to what the parameter changes, so the main way to figure this out is to try editing them and listen. one solution proposal up for debate is to group the more similar parameters together and provide descriptions of them. This should enable the users to better understand how to interact with the sliders in order to reach a desired effect.

No user involvement (6)

This is a very brief theme containing comments of situations where TC haven't involved users in the design process. It's mainly in correlation with the first question concerning how they decided which features to include in the TonePrint app.

Decisions made from personal opinions (8)

Many decisions made in the design process comes from personal opinions. This theme emphasises the need for more user involvement instead of relying on a general gut-feeling within the development teams. Designing the information architecture of the TonePrint was for example done on the basis of their own gut feeling of how it should look and behave.

Inspiration from external products (9)

In this theme it becomes clear that TC Electronic have been looking at other companies for inspiration for the TonePrint Community. Examples of this are *Soundmondo* from Yamaha and *The Fyre Effect* from AudeoBox, who both offer a community, to some extend, to the users. From their research into these, they have found that having a 'like'

feature may risk many effects being difficult to to discover until they get likes themselves, which TC wants to avoid happening in the TonePrint community.

Micsellaneous (9)

As the name of this theme much indicates, it contains codes that are too unique to fit in elsewhere. If the codes don't seem to bring any applicable content to the analysis, they may also be placed in this theme.

Native UI (17)

Following the initial release of the newest version of the TonePrint app, TC received negative feedback from users who thought the app was simply working too slow. The reason for this was that TC originally used a cross-platform approach for developing the TonePrint app. Things that made sense for developing the app on android would cause issues on the Iphone version and vice versa. TC therefore made changes and fixed these issues by making different design solutions for the different platforms.

User involvement (21)

As it has already been elaborated on, user involvement isn't a completely new area for TC, but it is something they want to apply further in their design process. This theme covers the codes concerned with situations where TC actually did involve the users to some extend, and an example of this is how the development of the TonePrint editor was based on a user study involving bass players interacting with the virtual front. Another example is the workshop conducted by Andersen (2015), where potential end-users' wishes for a TonePrint community was investigated. It seems reoccurring that they want to know what find out what the users want through these studies instead of figuring out what they need.

External developers (3)

TC have on previous occasions involved external designers and developers in the development products. A great example of this is the very first version of the TonePrint app. This was designed by an external designer but implemented by TC's own programmers.

User feedback (13)

There are typically two ways that TC receives feedback from their users. Either they get feedback through their facebook site *TonePrint Junkies* or through their Music Tribe Community Forum. Much of the feedback they get is about feature requests for the TonePrint app, and this is something that TC are good at keeping track of. The feedback is also about issues found in their products. Every member of the development team is a member of the facebook site, so each of them do have some user contact, but typically the feedback has been through the marketing team first.

Community requests (4)

The idea of being able to share User TonePrints with other users has been a request since the beginning of the TonePrint concept. TC obviously acknowledges this request, but as it has already been mentioned, it is an extensive and time-consuming task. They have however been making steps towards beginning an actual development process of this community, as they see it as a matter of time before the users find other ways of sharing User TonePrints with each other.

Sharing detained (9)

In correlation with the previous theme, TC have had to make precautions for the users not to find ways of sharing User TonePrints through other means than their own systems. TC describes how they have locked the files that represent the TonePrints in order to stay in control of how this is done. This has lead to some users finding creative workarounds to share their TonePrints anyway, with examples of users who have taken screenshots of the parameter settings in their editor and tell the other users to set their parameters the same way.

Community tags (17)

One feature that seems to be of great interest for the TonePrint Community is what TC refers to as *tags*. The intention is to assist the users of the TonePrint community in finding certain TonePrints by providing them with tags for categorisation. Some suggest that the users should be completely free to come up with these tags themselves, while others suggest that the users should be provided with a limited number of pre-defined tags. They do however agree that the challenge with such a feature is that it depends on the users' understanding of the tags. What may be obvious for some users may at the same time be misleading to other users, as it can be very subjective what they mean.

Community Features (besides tags) (16)

Beside the tagging feature, TC has also given thoughts to other elements to include in a future TonePrint community. Some of them emphasise a way of subscribing to another user, where they would be kept updated when this user would upload new TonePrints. This would make the users resemble the professional artist in the existing TonePrint app, as they would have the potential of becoming idols themselves. In order to further support this possible motivation for using the TonePrint community, Text descriptions and other self-promoting elements such as links to examples on Youtube or SoundCloud could also be included. For all of the subjects in the interview, it in general seems as the ideas for the TonePrint community relies on some sort of account system for the users, which currently doesn't exist for the TonePrint concept and as such requires a database for managing it. Other important considerations revolves around how the TonePrints are prioritised when displayed to the users. Some of them suggests by name, rating, or whether they have an extensive text description. One of them even suggests a way of

logging which TonePrints are used more then others and then bring these to the top of the list. Whatever the solution may include, they all agree that an effective search functionality should be included with this.

Community decisions (19)

This theme is very broad, as it covers decisions already made for the community in general. One of these, which they don't fully agree on yet, is how much they believe the community should be integrated in the current TonePrint app. Some of them wants it fully integrated with the current system maybe as a tab much like with the editor, Others want to keep it separated with just a few sharing and uploading options available in the app. They want the remaining "social media" elements to be a thing of its own. What they do agree on, however, is to include the users in its development, in order to meet their expectations in the end.

Focus on users and user-friendliness (14)

This theme covers the extend to which they already know their users. They want their users to easily be able to use their products, but they have currently just scratched the surface of including them in the design process. The comments concerning this do state that user-friendliness is a high priority focus for them, but there seems to be a lack of understanding of how and why.

TonePrint app prioritisation (3)

The maintenance and further development of the TonePrint app has become a priority on the same level as for other TC Electronic products despite that they offer this app for free. This has resulted in more time and resources being allocated to its further development. This is also a factor in why the development of the TonePrint community has been postponed.

SCRUM (24)

This theme is concerned with their framework in the design process, SCRUM. Each sprint is three weeks long and by the end of this timeframe, each member may present results of their work. Before the start of a sprint, they check the backlog to determine what tasks to focus on and how to prioritise them. If a task is considered too time-consuming for a three week sprint, it is deconstructed into smaller tasks which then are divided between the current and future sprints. The SCRUM method is in general considered beneficial by the development team, as they agree it helps them focus on what is currently at hand and then postpone the less important tasks for later sprints. Planning and executing the sprints seems to be a fine balance between staying realistic in correlation with goals, and having more tasks to engage with if they finish their initial ones before the end of the sprint.

No outlined goals for the TonePrint app (4)

TC don't seem to have outlined goals for the TonePrint app, and in their own words this may be because it's a product they offer for free. Every now and then, some of them do check how many people are using the system though.

Appendix D

Card sort cards

- User biography
- TonePrint parameter settings
- Artist library
- Link to other social media profiles
- TonePrint previews created by other users
- User library
- 'Effect type' filter
- Description of personal equipment
- Tags describing a TonePrint
- 'Pedal type' filter
- "Other users also liked this" recommendation
- Public forum
- 'Artist' filter
- News feed from "subscribed to" users
- Automatic cloud upload
- TonePrint upload system
- Feedback from users to TC Electronic
- User rating system
- 'User' filter
- "Other TonePrint users near you" suggestions
- Description of personal setup
- TonePrint description
- Pedal library
- Private forum
- User's favourite artists/users
- TonePrint categories
- Beaming tool
- 'Rating' Filter
- Professional artist feedback
- Seaching system

- 'Genre' filter
- User ranking overview
- Comment section
- TonePrint library
- "Subscribe to useers" system
- TonePrint download system
- Self created TonePrint preview
- 'Popularity' filters
- User's favourite genres
- TonePrint editing available for friends
- Feedback from TC Electronic to users
- TonePrint rating system
- Automatic cloud download

Appendix E

Concept maps from workshop

This appendix contains the concept maps made by the subjects in the workshop at TC Electronic headquarters. the individual maps were drawn in hand by the subjects during the workshop, including one produced through a group effort. All of these are displayed on the following pages, and re-depicted versions of them are all included in chapter 9, showing in more details what their intentions were.
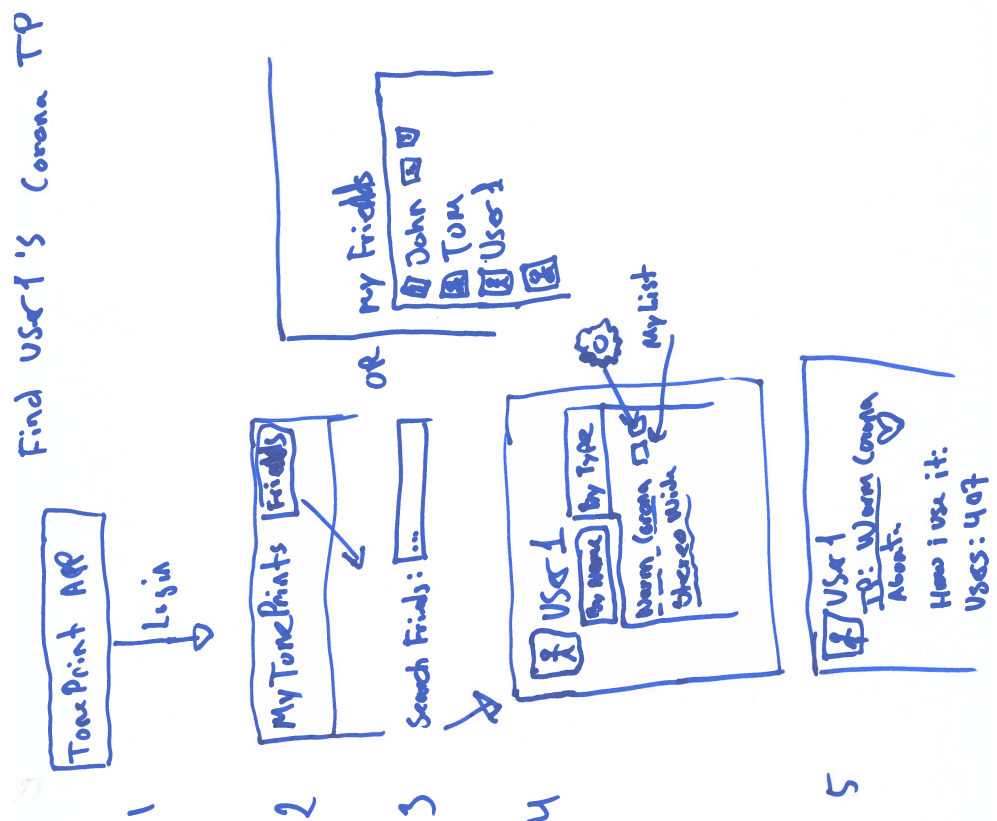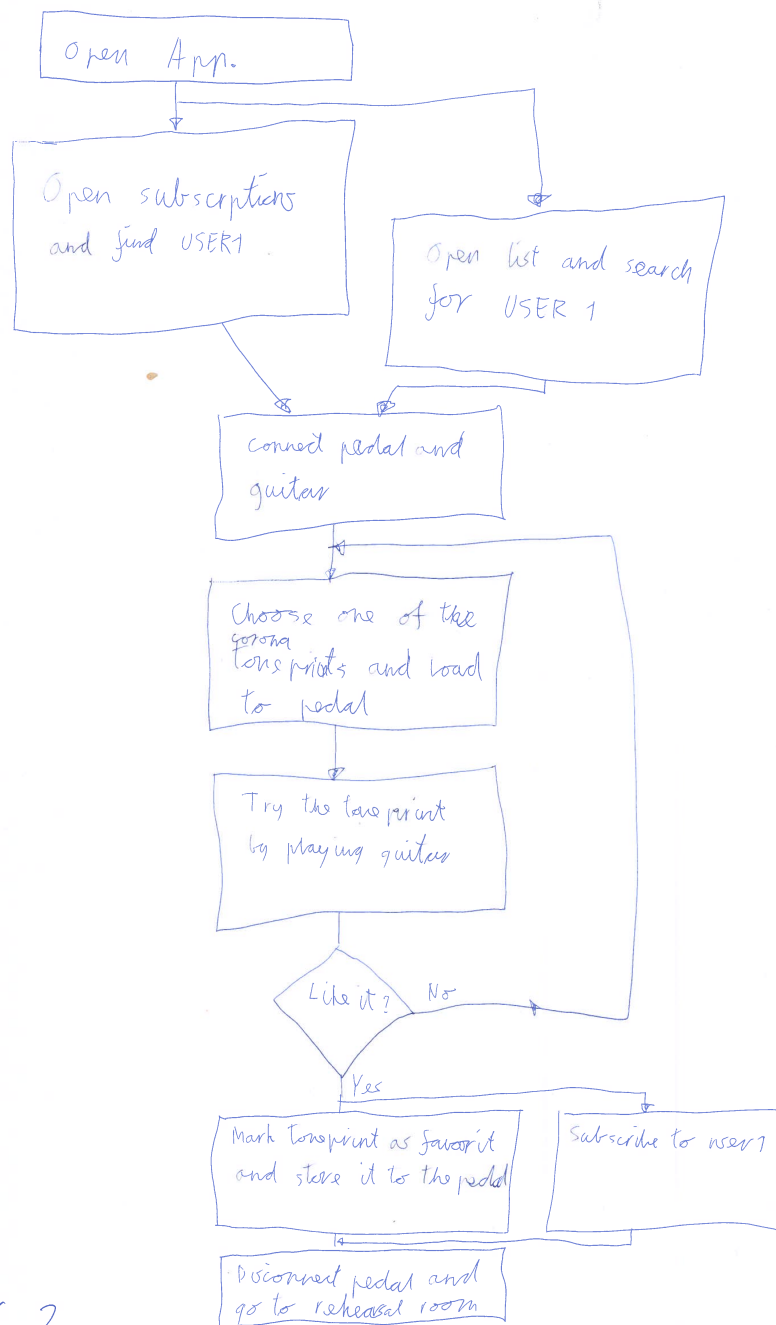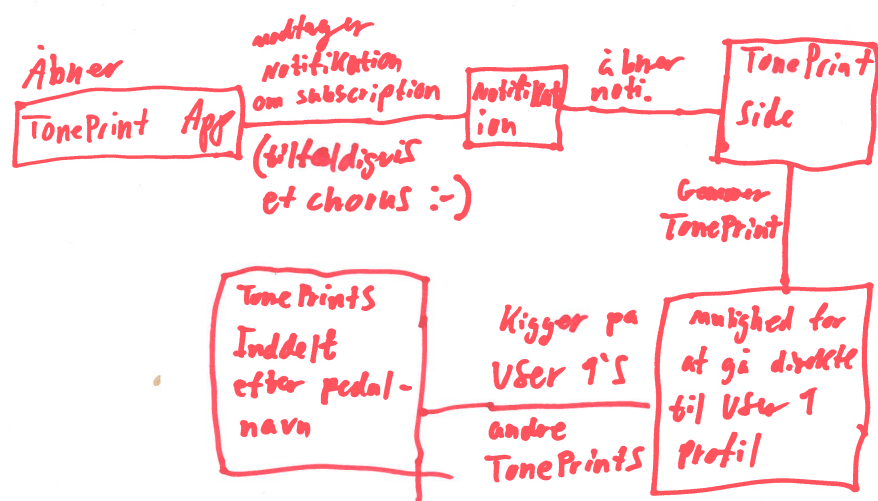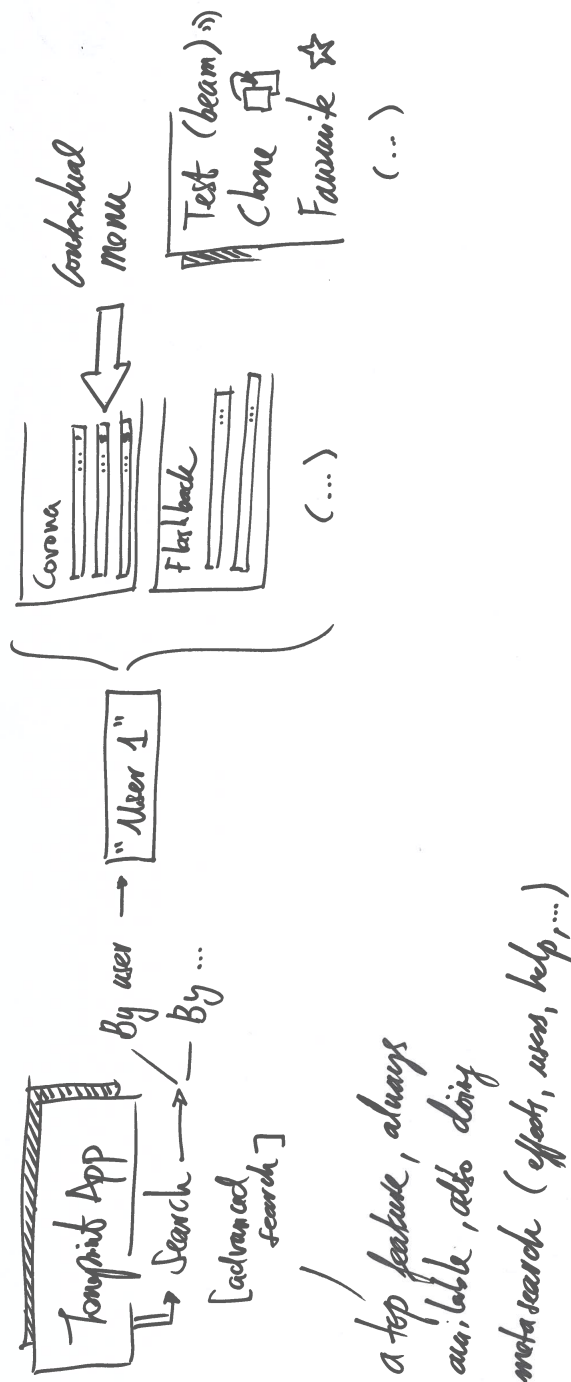
Figure E.1: The concept map drawn by subject 1.

Figure E.2: The concept map drawn by subject 2.
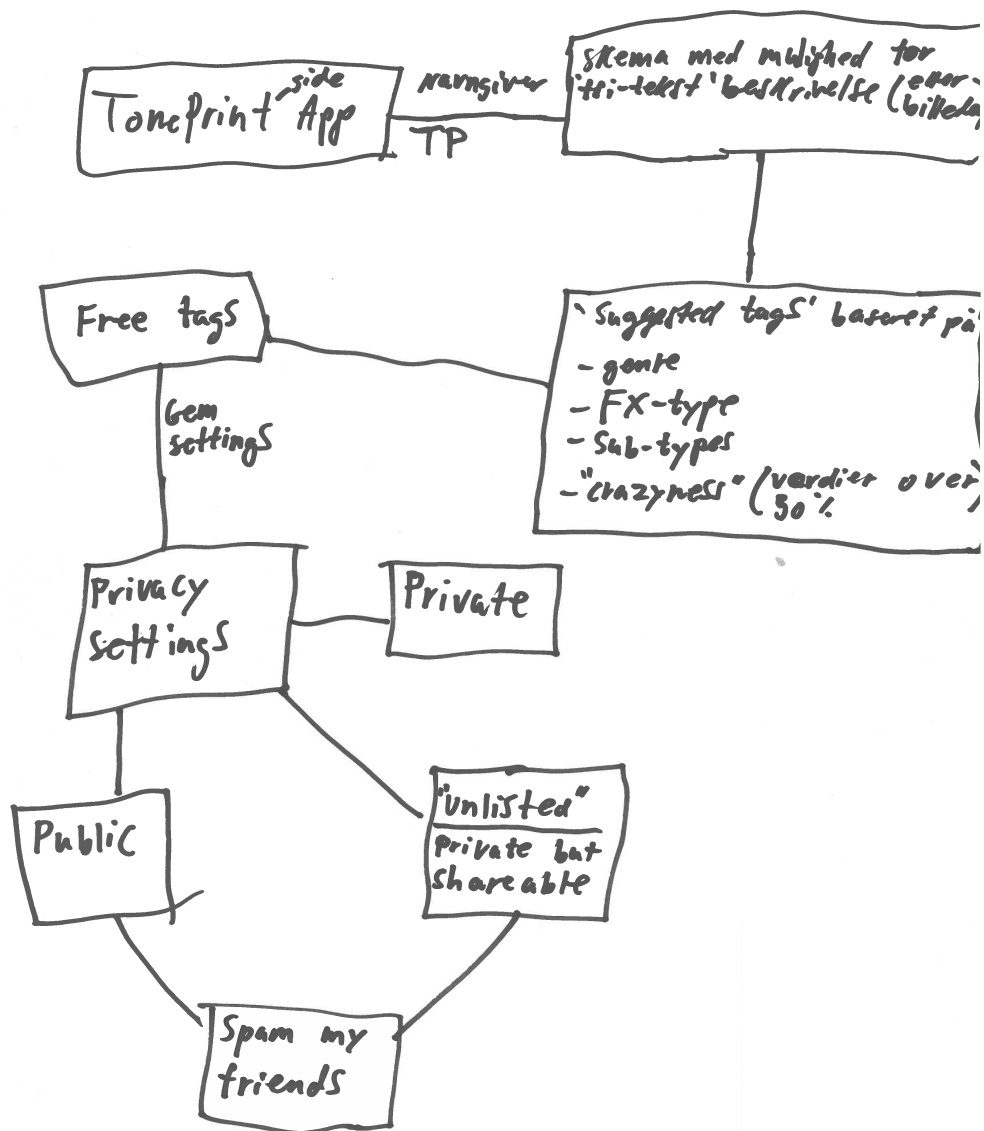
Figure E.3: The concept map drawn by subject 3.

Figure E.4: The concept map drawn by subject 4.

Figure E.5: The concept map drawn by subject 5.

Figure E.6: The concept map drawn by the entire group

Appendix F

Digital appendix

This appendix serves as an overview of the content of the digital appendix referred to in this paper. This includes a short description of the content and where it's located in the Digital Appendix folder.

Interview transcriptions

The PDF file **Interview transcriptions** contains the transcriptions of the interviews with each of the four subjects, described in subsection 3.1.1. The transcription is in danish and is presented chronologically as the interviews were conducted.

Coded Themes

The PDF file **Coded themes** contains the themes from the thematic analysis section 3.2 as clusters of the codes and data extracts that the themes are based on.