

SOCIAL CONTROL - ENABLING CONTROL FOR GROUPS OF PEOPLE

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ABSTRACT

Media and entertainment devices typically are controlled by one person at a certain point in time. But novel developments allow people to sit on the sofa, where one person is watching TV and a second person is listening to music – with sound clouds that are around them - not disturbing each other. The control of such sound-clouds or areas where people are in close proximity but want to control different sounds and images asks for new ways of control. In this paper we present a framework on how to design for social control. This framework especially demonstrates different ways on how to distribute authority and responsibility when designing entertainment services to support multi-user involvement for physically close people. The paper presents an extensive state of the art on control and the concepts of authority and responsibility and a framework for social control. Based on a user-based evaluation study comparing the different ways of social control we demonstrate how to enable control “in a social way” in terms of authority and responsibility for the control functions.

INTRODUCTION

Control of media and entertainment services is becoming social. From everyday usage of entertainment services and devices we are all aware of a variety of scenarios where control involves a group of people. A typical example is the introduction of loud speakers, like Sonos ¹that are available in today's living rooms. We all might have experienced the difficulties, when it comes to the establishment of a common playlist, to see who is allowed to control the volume, or skip a song. But control of entertainment functions by a group of people is not limited to the living room, but applies also to situations like in a car.

Key to the understanding of how to establish shared control, is to investigate different concepts on who is allowed to control what function, and how this can be used to enable (1) the selection and combination of items and (2) and indication of what items to be applied in which (physical) area or on which kind of device (e.g. in the case of local sound clouds, or the combination of different screens or devices in an area).

For a social control framework two design principles are of key importance: first, the authority of who is allowed to control what, and second the responsibility, so who is responsible for a certain outcome of an action (especially when control fails) [2, 4].

The remainder of the paper introduces briefly what our definition of control and social control refers to, then presents a set of key design principles for social control which demonstrate different levels of authority and responsibility as part of their concept implementation. We report findings on the differences and similarities of these concepts

¹ Sonos: <https://www.sonos.com/de-at/products/wireless-speakers> last accessed: 2021-06-03

based on a user-based user experience evaluation study. The paper concludes with a set of recommendations for follow-up research to design for social control.

SOCIAL CONTROL: A STATE OF THE ART

Control originally means the ability of a user to influence a situation or to keep a system in a state that supports the user towards reaching their goals [1]. To enable control from a design perspective we have to enable the user of the system to perform these actions by considering the user's skills and cognitive abilities. When we design for control today, this means we have to allow the user to interact with the system, at certain moments in time. This requires careful balance between what is performed automatically (automated) by the system, and what the user is allowed to interact with. The user's ability to control is called authority. This means, the level of authority defines what the user is allowed to do or not to do [4]

Authority in entertainment is associated in most cases with basic control of entertainment-related functions (direct manipulation). In the case of a car, this would mean that the authority over what radio station is played can be with the driver (as he/she might be the only one able to reach the controls), while the passengers are not able to perform the control. In this case authority can be defined in a physical way, by allowing access via the ability to physically reach the direct manipulation area.

From a design perspective this physical authority can be translated to functions made available in the user interface that allow other people to control it. By moving away from the 1:N design principle where one user controls N functions, we can enable X users controlling all N functions at the same time. A typical example from our everyday practice is a remote control that is handed over to a different person to control the TV. But once the interface is not physical any more, moving to interactive systems enables another variation of possibilities to share or hand over control. Interactive system design enables not only X different people to control a given set of functions, it allows different people to control different sets of functions, while the set of functions a person can control is represented as the authority. This is typically described in an interactive system as the "rights" the person has within the system.

Relationships between different authorities have been modelled in various ways, see Bernhaupt et al. [2] for a brief overview on hierarchical rights and control management. When it comes to the control of different sets of functions by different groups of people, the research field of Computer-Supported Cooperative Work (CSCW) [5] has been establishing a broad range of approaches and concepts that we all use today in our office environments for virtual group work (e.g., the use of Google docs²). With regard to entertainment services, Spotify for instance introduced the possibility to make playlists publicly available or to allow the creation of a playlist with friends (different users can add songs to a playlist) [6]. While authority is the ability to control, a key question is who will be responsible if things go wrong. What if the wrong action is chosen, who would be responsible for the unagreeable music choice during the party?

Responsibility is assigned beforehand to motivate certain actions and evaluated afterwards, where the actor is held accountable or to blame for a state or action of the human machine system and consequences resulting thereof. It can make sense to differentiate between a subjective responsibility that an actor feels regarding his actions,

² Google Docs: https://www.google.com/intl/de_at/docs/about/, last accessed: 2021-06-03

which can differ from the objective responsibility mostly defined by other entities and by which the actor is then judged [4]

When it comes to the next generation of control in a group, we have to design not only for the basic principle of who is controlling what (authority), but also who is responsible for the outcome and how these two aspects relate to the overall user experience.

SOCIAL CONTROL CONCEPTS

Social control typically encompasses two aspects. It can either refer to a group deciding together what to control/select together and then enjoy the outcome as a group, or by deciding what to control/select and then including the decision on who is enjoying the content where. Both scenarios are based on the same principles of social control.

The goal of our social control framework lies in the support of active cooperation among a group of users and to foster user experience. We therefore developed a series of concepts, and selected the most prominent (in terms of difference) concepts based on the social situation of in-car passengers who ride together. The different concepts focus on ways of distributing the level of authority among users based on the creation of a shared music playlist while riding, and how they refer to the feeling of responsibility of the outcome of this social control process.

In the following, we demonstrate the developed concepts in more detail, based on the scenario that a group of people (in a car) is requested to establish a common music playlist.

Common Agreement (or “communism”) Concept: The common agreement or “communism” concept supports cooperative work based on common agreement. Every group member has the same level of authority on adding music to the playlist. However, each group member needs to agree on the decision to execute an action. For instance, adding a song to the shared music playlist only gets executed in case every user actively adds the (same) song. The communism concept thus forces all the users to agree on the action to be performed.

Token-Ring Concept: The token concept aims for fairness and structure. Based on a moving time-slot of five minutes, one group member can perform a maximum of five actions within this time-slot (e.g., adding a song, removing a song from the playlist). After the number of actions was performed, or the time exceeded, it is another group member’s turn. While one group member has the “Token” and can perform actions, all other group members can only observe and need to wait until receiving the token again. This concept gives everyone the possibility to contribute equally to the music playlist at a dedicated time.

Hierarchy Concept: The hierarchy concept is based on different authority levels among group users. This means that not every user has the possibility to perform all available functions all the time. Our hierarchy concept demonstrates three different authority levels. A user with Level 1 authority can only add songs to the playlist while a user with Level 2 authority can also adjust the position of a song within the playlist. Level 3 represents full authority which allows users to remove songs, start/pause the playlist or adjust the volume.

Dictatorship Concept: The dictatorship concept has, as its named, one person of the group that dictates the control. The key-user (very often in computer science referred to as administrator) has full access to all functions and has the authority for all the control. All

the other users can only influence the decisions of the key-user by other means (e.g. by talking to the key-user). The dictatorships concept gives not only full authority to the key-user, but also establishes the full responsibility of all actions for the same key-user.

“Everyone-can-do-everything” Concept: The “everyone-can-do-everything” concept gives all users the same authority and same ability to control, with a last action taken overruling all precedent actions.

RESEARCH GOAL AND METHOD

We conducted a user study to find out which type of social control performs best in terms of UX (hedonic and pragmatic qualities) and usability. Besides that, we were interested in which concepts are generally preferred over others, depending on the authority and responsibility they implement.

The five different social control concepts, which have been explained above, were tested in an in-car environment. Three passengers (a front-seat passenger and two back-seat passengers) were sitting together in a standard passenger car. Their overall goal was to create a shared music playlist together. The different types of social control enabled all passengers to contribute to the shared music playlist in different ways. This means, the level of authority and the associated level of control differed between the social control type/concept and between the passengers. Depending on the concept each of the passengers then can have a different perception of the responsibility on the outcome.

The main focus of our research was to understand and evaluate: What type of social control performs best in terms of overall user experience and standard usability (pragmatic quality).

USER STUDY

To receive insights into how the different social control concepts are perceived from a user’s perspective and to understand its effect on user experience, we conducted a user study in a parked car.

Implementation & Prototype

We implemented a touch-screen based music application for the Windows platform with the Unity 3D engine. Overall, the music application consists of four main regions as demonstrated in Figure 1. On top it shows a search bar and information about the user (1). On the left half of the screen, the library of songs (2) is displayed. By touching a song in the library, the corresponding song gets added to the playlist in the case the playlist does not already contain the song. Otherwise, the song gets removed from the playlist. The created playlist is displayed on the right side of the application (3). All songs on the playlist can be moved up/down or removed by pressing the displayed buttons. The bottom (4) shows the currently played song and allows the user to play/pause, skip/rewind or to adjust the volume.

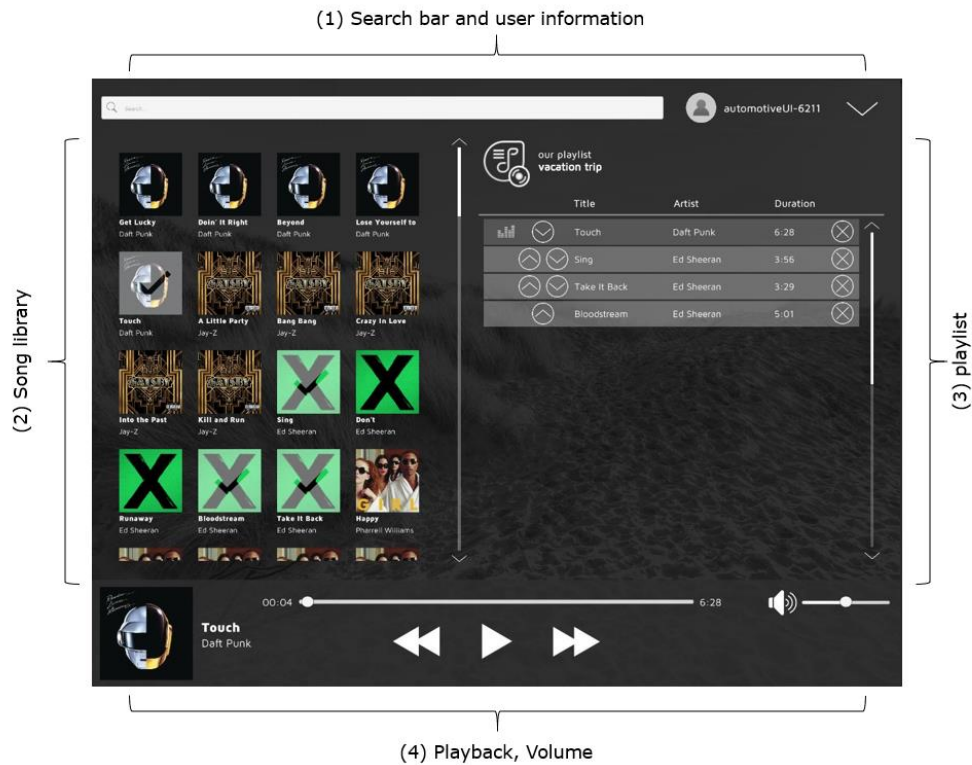


Figure 1 – Demonstration of the implemented music application’s user interface and its provided functionalities.

Depending on the concept and its accompanied authority level, the user interface adjusts accordingly. This means that executable buttons are not visible in case the authority does not allow them to perform the action. Figure 2 shows the different user interfaces depending on the level of authority based on the hierarchy concept. The left image shows full access which means Level 3 authority while the right image shows Level 1 authority where the user can only add a song to the playlist (this is why the playback buttons are not visible).

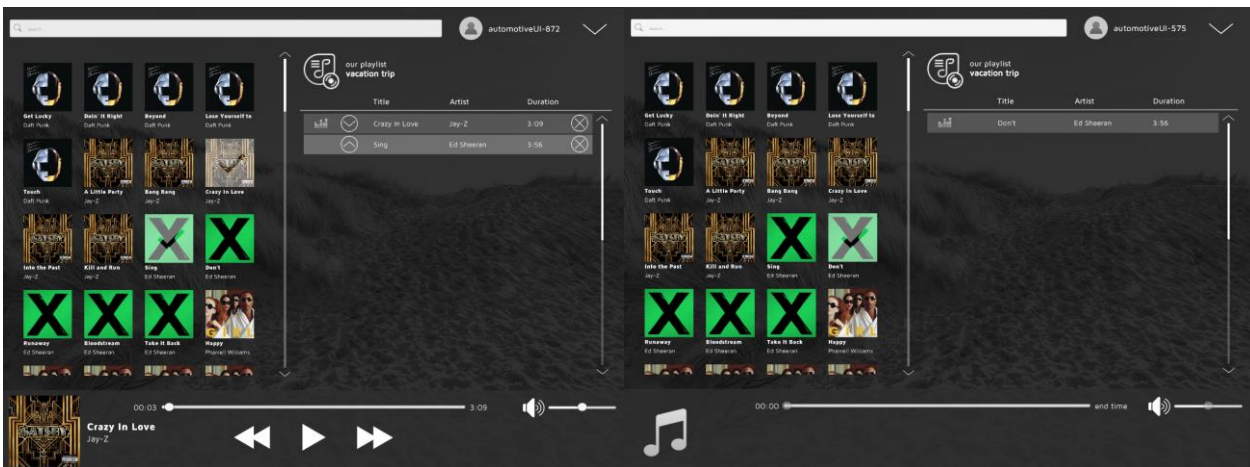


Figure 2 – User interface for the hierarchy concept. Left - user interface with Level 3 authority. Right - user interface with Level 1 authority.

Participants and Set-Up

We recruited participants through company and personal contacts. Overall, 27 people (13 male, 14 female) from Austria participated in our study. Their age ranged from 18 to 59 ($M = 39.5$ years, $SD = 13.35$ years). All, except two, own a driver's license. People were familiar with each other, indicating to either having a family relationship (9 participants) or being working colleagues (18 participants). We explicitly recruited people that knew each other to balance for possible influences that could come from working with strangers in such a setting. The testing in the car adhered to the pandemic regulations for COVID19 within the company (FFP2 masks were obligatory, all car doors were opened, all devices continuously sanitized).

The user study was conducted with 9 groups (3 participants per group). All groups started with the "everyone can do everything" scenario and then had a randomly selected, fully counterbalanced, set of additional 4 scenarios for social control to use.

For each of the concepts we measured the overall usability of the concept (SUS questionnaire [3]) and the perceived user experience (UEQ-S [7]). At the end, the participants ranked the concepts in terms of preferences from top (most preferred one) to bottom (least preferred one). To understand any possible influencing factors, we video recorded with a smartphone installed on the dashboard and additionally audio recorded for qualitative feedback.

RESULTS

User Experience

The concept of "everyone doing everything" unsurprisingly had the highest rating in pragmatic quality (it allows authority for everyone) (see Figure 3). Of course, when it comes to responsibility and overall experience this concept is seen as more nuanced. The perceived level of authority clearly affects the perception of the pragmatic quality. If the user is able to decide alone, the control will be efficient and effective and thus have a high pragmatic quality. If it is necessary to adjust to others, the pragmatic quality is lower.

In terms of hedonic quality, a key factor for the experience is the degree of autonomy the user has in the social control concept. The dictatorship concept shows the lowest degree of hedonic quality (avg, 0,34, $SD = 1,67$) while the communism approach (with the necessity that everyone agrees) has the highest (avg, 1.38, $SD = 1,27$).

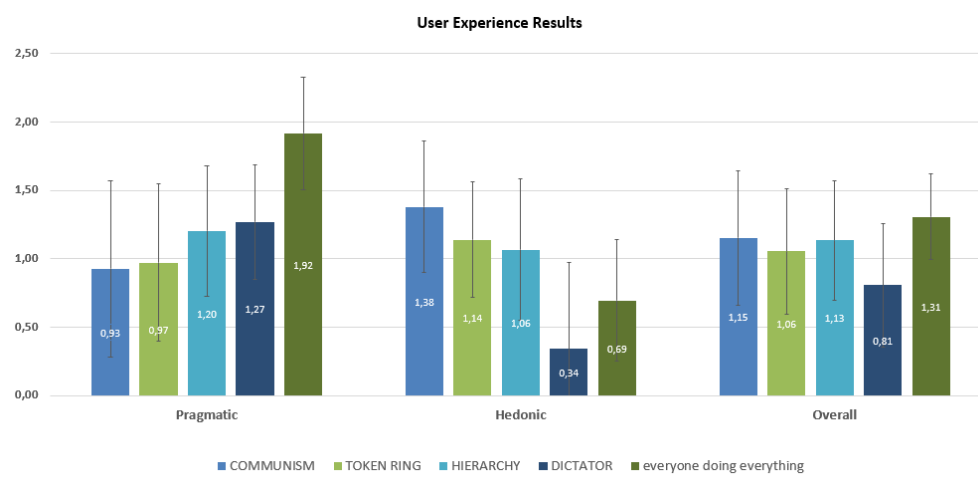


Figure 3 - Results from the Pragmatic and Hedonic Quality and the overall UX ratings for the five different concepts

Usability

Independent of the authority or responsibility perceived, all social control concepts show the same high standard when it comes to usability (see Table 1). They all scored a good usability (above 75). The concept that “everyone can do everything” of course scored significantly higher compared to all the other concepts. Unfortunately for a real use case, this concept is not applicable.

Concept	average SUS score (n=27)
“Everyone can do everything”	87.68
Communism	75.74
Token Ring	75.74
Hierarchy	77.03
Dictator	78.14

Table 1 - Results for the average SUS scores, indicating overall good usability of all of the social control concepts

Ranking and rating:

The overall ranking score is the sum of the individual rankings. Depending on the ranking position, the concept received points. This means the first, most preferred concept received 5 points, the second concept 4 points, and so on. In terms of the overall preference, the “everyone can do everything” concept is liked best, followed by communism, hierarchy, token and dictator.

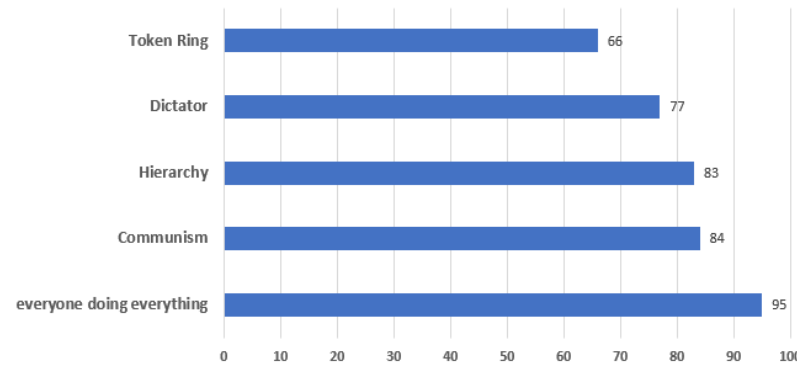


Figure 4 - Overall ranking scores for the different control concepts

INTERPRETATION AND CONCLUSION

When it comes to social control and for example deciding together on what element (e.g. a song) is played on which device (e.g. on the TV or on the portable loud speaker), ideally every user should be allowed to control all the functions. In a practical setting this will of course not be applicable, as everyone can override everything, not allowing resolution of conflicting (social) control situations.

For the implementation of the next generation of social control, it will be key to enable users a certain degree of authority that balances the responsibility. The “all together- or communism” approach clearly balances this responsibility to the group of people and in our results scored high, together with a more hierarchical approach, that in terms of design allows clearly the identification of who is responsible for an action.

The influence of authority on the perceived pragmatic quality can be interpreted as the more authority for everyone, the higher the perceived pragmatic quality. For the hedonic quality the key aspect of individual versus group control, seems to be the major design factor. Of course, when it comes to control, being enabled as a user to control without taking into account anyone else is preferable. For the social control situation (while rated lower than the individual approach), authority and responsibility seem to be similar for the different concepts.

Our impression from running the study was that especially the first user experience and the peaks of (negative) experience while interacting with a concept contribute to the overall user experience. In the follow up studies we will be focusing on what parts or aspects are key for the user experience, given that we cannot enhance all aspects of a user experience in such complex scenarios.

We also envisage to apply these concepts to more complicated control scenarios (e.g. not only what to play on which list or device), but in a more general sense on how to change control structures for the smart home or in-car entertainment controls in general, making social control a key design factor, and not an add-on at the end of the design and development process

LITERATURE

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