

Design Workshop II

Annika Voss, Chiara Kirschbaum, Lea Goerl, Petra Laboda

UrbanPulse - Your unique atmosphere in public places

Final Report

Ludwig-Maximilians-Universität

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1 Introduction

Richard Buchanan asserts that one of the greatest strengths of design is that it is not definable in solely one specific manner [1]. Design is a field of research that continuously evolves and relies on continuous self-reflection to adapt to the challenges and needs of society. Design is a broad term that can refer to the design of products, services, systems, environments, and even processes. Often people make the mistake of reducing design exclusively to the aesthetic design process, although design also serves functional, social, cultural, economic, and environmental functions in addition to aesthetic aspects [2]. The design gives meaning to things that are developed [3] relates to how these things function [4] translates the utility and values into cultural behavior in context [5], and reflects how products are used and utilized in the long term [6]. Design refers to creating things and processes that enhance human experience and interaction. It pertains to creating solutions that improve people's lives and fulfills their needs and aspirations. It involves having the ability to identify problems, come up with new (future-oriented) ideas, and turn those ideas into concrete solutions.

As part of the Design Workshop 2 course, we explored the topic of "Personal Light Environments" and researched how to develop applications for managing illumination in our everyday lives. The following questions constituted the foundation of our design elaboration: *How is light controlled? How can light augment personal topics? How can we capture and react to dynamic situations in everyday life? How can the app interface with the real world? Can the real world be an extension of the app context or the app interface? How can light support our everyday life?*

As designers, we have the superpower to influence the present and future of society and production. Therefore, what applications we develop, how people apply them in their daily lives, and what impact they can have on the development of society and the environment is the responsibility of designers in collaboration with other disciplines. We cannot be apathetic about how and according to what criteria we create products. We believe we should consider design as a mission with social responsibility and relevance. Accordingly, we can define two relevant tasks: First, designed products should serve and benefit people and the community. Secondly, the design must contribute to creating a more environmentally friendly world and the coexistence of people. Following this philosophy, we set ourselves the challenge of designing an application that would qualitatively enrich people's everyday lives by allowing them to adjust the light settings to their personal needs and preferences while at the same time supporting economic progress and environmental sustainability.

The journey from the initial situation to the high-fidelity prototype of the "UrbanPulse" application will now be thoroughly documented and explained in this final report.

The development of our concept follows the "User-Centered-Design" (UCD) approach. Here the focus remains on the user's needs, abilities, and preferences. The goal of UCD is to develop products, services, or systems that are intuitive, efficient, and pleasant to handle for the users. At the center of user-centered design are the users themselves. Thus, we actively seek to understand the needs and requirements of users, take their perspective, and incorporate it into the design process. This approach relies on intensive engagement with users during the design process leading to better and more user-friendly products. Figure 1 depicts the basic phases of the process we traversed within the lecture, specifically analysis, conceptualization of design ideas, implementation, and optimization.

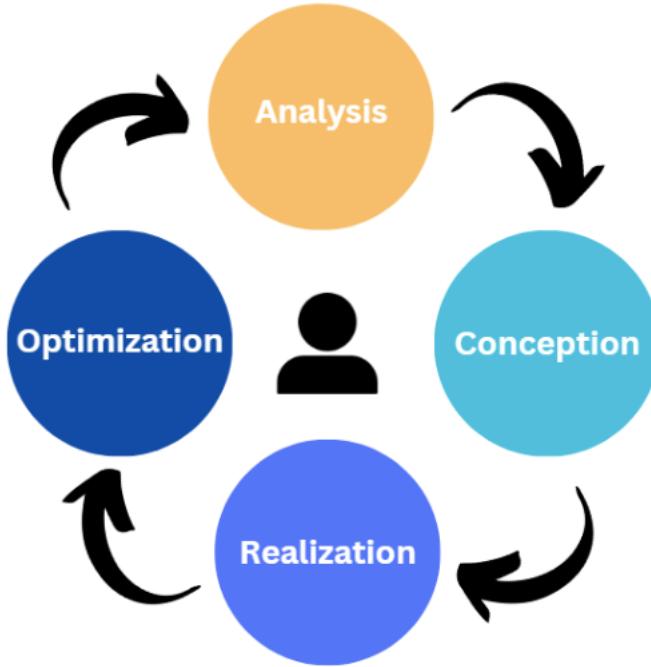


Figure 1: Phases of the User-Centered Design Process.

2 Analysis

During this phase, we conducted extensive research to identify a specific target audience and determine user needs and existing design solutions on the market. The analysis included market observations and the creation of user flows, a persona and an empathy map.

2.1 Benchmarking and user flows

The first operational step in the analysis phase is the execution of **benchmarking**. It is a systematic process in which we have examined existing applications in the market to compare performance, processes, and procedures with the best in the industry. Consequently, the goal is to identify proven techniques to learn from and be inspired by to improve our performance. In other words, it's a continuous learning and improvement process. Based on this preliminary task, we have already become acquainted with current implementations in the area of "light controlling" applications. Furthermore, we identified weaknesses in the present processes and worked specifically on implementing these aspects differently or better in our application. Besides, benchmarking serves to discover new, innovative approaches. It enables us to look at services from the customer's perspective. By understanding customers' expectations and needs more precisely, we can adapt and improve products in a targeted manner.

We carefully examined the following three applications: (1) *iDeal LED*, (2) *WiZ*, and (3) *HappyLighting*. The selected applications represented specific characteristics relevant to us, such as (1) *creativity*, (2) *smart-home light control settings*, and (3) *personalization*.

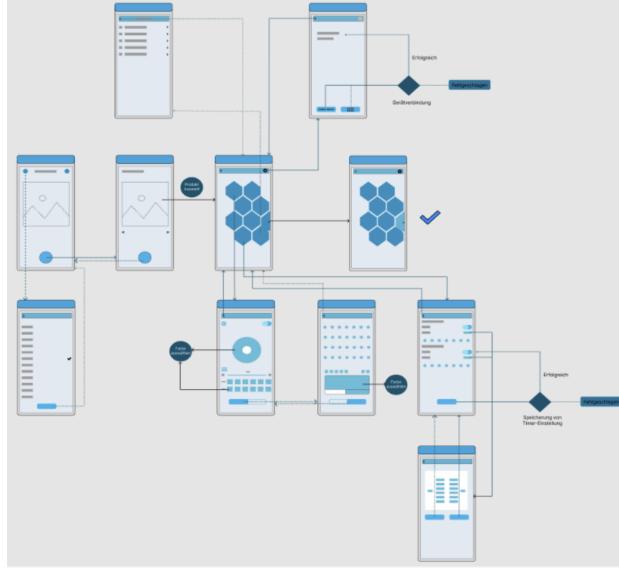


Figure 2: User flow of light apps.

(1) A particular attribute was the playful and simultaneously illustrative presentation of the user interface in the case of iDeal LED. The often animated interactive surface could immediately attract the user's attention. Therefore, the application stood out from other systems. Such a design solution motivated us to work with illustrations in our application as well and avoid basic interaction possibilities (such as mouse clicks, buttons). Instead, the application encouraged us to integrate special operation possibilities (XXX) in our design. However, when analyzing the process of user interaction with the product, we noticed that animated UI design elements could lead to inconsistencies in design and performance problems. Finally, we concluded to appropriately balance creativity, usability, and usefulness in our product. (2) The WiZ system provided an example of how people can integrate smart home lighting into their everyday lives and control it via an application. Emphasis was placed on functionality and usefulness, highlighting the necessary functions of such lighting tools, accompanied by consistent and decent design. (3) HappyLighting underlined opportunities to personalize light settings in the environment. It included merging light with music, pictures, or illustrations to craft a unique and individual ambiance.

Further, we constructed **user flows** for the listed products to understand the user's interaction with each application. The user flow serves to visualize and analyze the process of the user's interaction with the product. Typically, we consider each step a user takes, from opening the application to achieving their goal or ending their interaction. We applied this method to identify weaknesses and bottlenecks in the user experience and discover whether the product meets the user's needs and provides a positive experience. Moreover, we discovered essential functions of applications on the market in the field of "lighting".



Figure 3: Elaborated persona.

2.2 Persona and empathy map

A **persona** provides a fictitious but realistic portrayal of a representative user of an application. In principle, it reflects a group of people with analogous behaviors, goals, needs, and characteristics. Due to the generation of persona, we evolved a target audience for our future idea, which specified the project since, at this point, we purposefully designed our solution for the requirements and expectations of the defined person. The course demonstrated that adopting a persona promotes user-centricity throughout the project. The work is not limited to technical considerations but incorporates human aspects. It allows for setting design priorities and aligning the solution's functionalities and features with the most appropriate user groups. As a result, potential issues can be identified and resolved in advance. An **empathy map** is a visual representation used to empathize with the end user. We put ourselves in the customer's shoes and described their challenges, motivations, actions, and goals based on four aspects. These aspects were (a) seeing, which refers to the user's observations and external characteristics; (b) hearing, which captures statements or feedback from the user and other people; (c) thinking and feeling, which engages with the end user's thoughts, emotions, motivations, worries, and concerns; and finally (d) saying and doing, which captures the user's actions, behaviors, decisions, and reactions. In particular, we noticed that having a persona and an empathy map provided a common direction and better understanding among the design team. We developed the same vision of the target audience and what requirements we intended to address with our application. Moreover, we felt it beneficial to have acquired objective information about the target client group. It reduced the bias of design decisions toward personal preferences and opinions. Figure 3 illustrates the elaborated persona in detail.

3 Conception

Upon completion of the analysis phase and data collection, we developed three preliminary application ideas during the course, whereby the third concept, entitled "UrbanPulse" remained the final candidate and was realized as a high-fidelity prototype.

3.1 Preliminary concept drafts

One of our ideas was to create a lighting control application for workplaces, in the office, and in private home offices. We aimed to enable an effective workflow and simultaneously promote the general well-being and health of the users. Individual light settings could have been used to signal work rests and exercises, allowing customers to achieve an appropriate work-life balance. Through visual stimuli, the application could have indicated not only pauses, on the contrary, but also pertinent work events. Overall, one dimension of our conception was the configuration of individual workplace design through light.

The second consideration demonstrates an application offering personalized light conditions to optimize the user's sleep patterns. The primary functions would have included a gentle wake-up function, visual and auditory stimulation for accelerated sleep onset, and light brightness control to support distinct sleep phases. However, based on multiple feedback sessions within the seminar, we opted for our final design concept, "UrbanPulse", which we will explain in greater detail in the next sections.

3.2 Final concept idea: UrbanPulse

UrbanPulse is an application providing the ability for individuals or social groups to book street lighting in public places in a smart city. The concept relies on a speculative vision of the future, where we assume that we live in an advanced smart city where people can reserve street lights, especially in public park facilities, and utilize them individually via digital devices, such as smartphones. Meanwhile, we aim to generate individual personalized atmospheres in the city and to manage through lighting control the consumption of individuals and the urban community, reducing pollution.

In particular, we would like to address the following user needs:

1. **Creation of individual atmosphere in the city:** The city inhabitants dispose of the possibility to customize the face of the town according to their preferences. It means whenever they have outdoor meetings and events with friends and acquaintances, they can adjust the recent street lighting or lantern in the specific park to their predilections. They can customize the color, the brightness of the light, etc. The ability to design a highly customized atmosphere in the city lends people a sense of connection and belonging to their urban living space.
2. **Social connectedness:** UrbanPulse promotes the organization of meetings and events in the municipality, which can lead to a strengthened community spirit and an improvement in social networking. By sharing their individual experiences, people may get closer to each other and develop deeper social bonds. The app thus serves to enrich social life in the city.
3. **Control light pollution in the urban area:** The booking function for street lamps has another goal: to deactivate street lamps that are not booked or to reduce their light intensity.

In a limited populated area of the city, the operation of individual lamps could be switched off. However, by wirelessly pairing their digital devices, individuals could connect to existing streetlights to ensure they only illuminate when they are genuinely needed.

4. **Increase awareness of own consumption:** As environmental issues and climate change continue to rise, people are increasingly eager to reduce their environmental footprint. The application provides users with an evaluation of their total electricity and light consumption during their activities in the community. Thus, we intend to raise their awareness of ecological behavior.

We embraced the concept as we believe UrbanPulse is a pioneering example of an innovative application that fully exploits the potential of smart city infrastructure. The app showcases how modern technology can be used to improve urban life and respond to the individual requirements of citizens. By actively involving residents in the design of their city and allowing them to customize their urban space, it strengthens the city's image as progressive and forward-looking. Furthermore, in an era when the conscious management of resources is a high priority, the app contributes valuably to sustainable urban development. Last but not least, in today's society, people are increasingly looking for ways to customize their environment and create personalized experiences. UrbanPulse allows users to customize lighting according to their preferences, which can lead to a stronger emotional connection to the city. The ability to tailor the atmosphere in the city gives people a sense of connection.

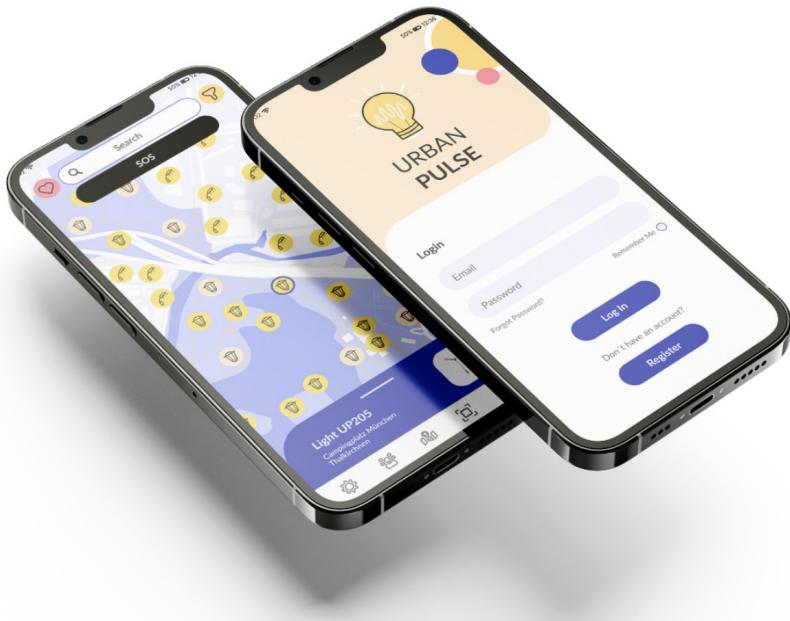


Figure 4: Final concept: Urban Pulse.

4 Realization

In the following paragraph, we would like to explain the individual work steps and design decisions that led to the creation of the prototype.

4.1 Work tool selection and fundamental design decisions

For the User Interface Design our goal was to produce a playful design reflecting the feeling of outdoor events as well as bonding among friends. Therefore, we decided to define a colorful and vibrant design scheme (see Figure 5) that captures the positive emotions of outdoor leisure activities. To achieve this purpose, we opted to apply elements illustrated specifically for the application. All illustrations were carefully hand drawn to create a unique and appealing visual aesthetic. These handmade illustrations add a personal touch to the application and make it stand out. Additionally, we developed a custom-designed map that embodies the charm and adventurousness of outdoor events to provide users with an authentic and vivid experience. The entire design concept was meticulously tuned to appeal to the target audience and ensure a positive, fun user experience. We believe our design approach delivers a welcoming atmosphere and encourages users to utilize the app extensively and actively engage in the world of outdoor events.

The illustrations primarily consist of vector graphics or are drawn to emulate the style of vector illustrations, providing a modern and clean aesthetic that aligns with the other design choices we have made for our app.

The main illustration (see Figur 6 left) was our idea to give the interaction with the selected lamp a playful element. It portrays a park lamp within a park environment. The monochromatic illustration was created using Procreate, but in a style that fits in with the vector graphic appearance of our other design components. The visual elements were kept to a minimum: there are only three stylised trees in the background to suggest the environment, and the interactive elements in form of the lamp and the speaker. In our prototype, we animated this illustration to demonstrate how the interaction would work. Swiping horizontally changes the color of the lamp, which is shown by changing the tint of the illustration. A pinching or spreading motion of two fingers dims or brightens the lamp respectively, which is suggested in the illustration by either dimming the colors and reducing shadow contrast or brightening the colors and intensifying the shadows. When the speaker is activated, it jumps once to indicate it was clicked. While it is active the sound lines around it move to show that music is currently playing. The illustration changes colours in time with the music as the real lamp would. A single click on the lamp sends a light signal, which is represented in the illustration by emitting a pulsing halo of light from the lamp.

With the map (see Figur 6 middle) we aimed for a simple style. It was drawn in Procreate and represents a Munich neighbourhood. We kept it monochromatic and the visual information to a minimum so it wouldn't overwhelm the user, when seen within the context of the surrounding user interface.

The icons (see Figur 6 right) were created in Adobe Illustrator and were inspired by the usual simplicity of app icons, but with softer edges to keep a sense of playfulness. It was important to us to create distinct icons to differentiate between park and street lamps so the interaction with

the map feels more intuitive. The icon representing our app is a playful illustration of a light bulb, which we animated to add interest to our loading screen. The light bulb's wire subtly incorporates the initial letters of our app's name.



Figure 5: Self-made illustrations in the design: Vector artwork for demonstration of a park environment to configure light adjustments (left), playful design of the city map (middle), icons for selection and filtering purposes on the map and the UrbanPulse logo illustration (right)

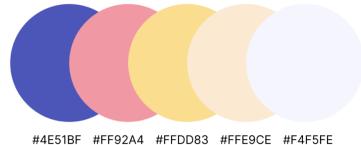


Figure 6: Color code of UrbanPulse.

4.2 Key features

Next, we would like to introduce and explain the primary functions of our application:

1. **Map Interaction:** The map provides an overview of existing smart and bookable lighting facilities. Once a user starts the application, the operator sees the nearest-located lamp displayed. The selected bulb is marked on the map circled in purple to visually distinguish them from the other unselected elements. Free bookable items are highlighted with a darker and stronger yellow tone to make the booking status of the lanterns more visible. We display previously booked luminaires on the map as well. The user has the option to book all available street lights, either immediately or after a previous reservation expires. Thus we always inform the user about the recent booking status; the customer receives visual feedback indicating the ongoing reservation and the remaining duration.

In addition, users can also search for places they have visited in the past. Moreover, the application offers the possibility to start navigation to a selected streetlight to help users with route guidance.



Figure 7: Map interaction on main page, reserved lamp (left), bookable free lamp (middle), my booked lamp (right).

In order to obtain information about the lamp, the user can filter by type of lamp. At the moment street lamps or parking lamps are preserved on the map. You can also filter by friends.

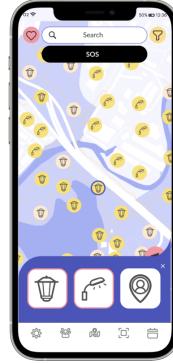


Figure 8: Filter on main page.

- 2. Finding friends:** In the app, the user can connect with friends and capture their location. The navigation feature allows users to navigate to their friends. Therefore, when a user picks a friend's location on the map, they can plan a route there and follow the app to reach the buddy. Eventually, they might transmit light signals to each other to meet up.



Figure 9: Finding friends.

- 3. Booking process:** The end user performs the reservation in the app by entering a date and a specific time, specifying the start and end time of their usage. The calendar view allows users to schedule bookings for a later period. Furthermore, the app offers to add friend groups to the bookings. In other words, if a user is planning a social event or celebration, for instance, he/she can invite their friends to join the booking. As a result, we enable the group to share the reserved street lighting or meet at a specific location.

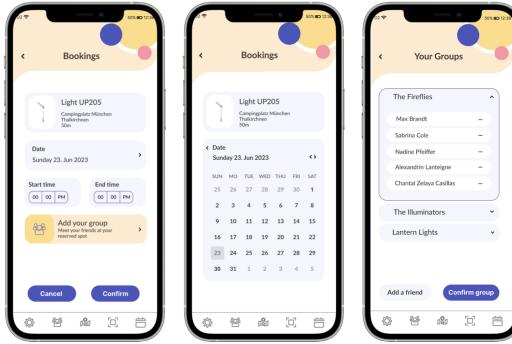


Figure 10: Booking process.

- 4. Lamp individualization:** After booking the lamp, the user can customize the brightness by zooming in and out and the color by swiping left or right. To do this, he can connect to the speakers in the lamp by clicking on the speaker icon and follow the instructions, and send a light signal to friends by clicking on the lamp.



Figure 11: Lamp individualization, speaker connection (left), brightness (middles), color (right).

5. **SOS Signal:** The SOS button supports the user in an emergency by being able to transmit a code to the emergency center with which they can encode their location and thus provide assistance as quickly as possible.

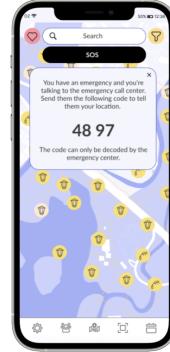


Figure 12: SOS Code.

6. **Consumption analysis and booking history:** In order to support the sustainability aspect, users can call up an overview of the energy consumption of their bookings in addition to their booking history. This is broken down monthly and the user is presented with comparisons that make the energy consumption accessible to every user.

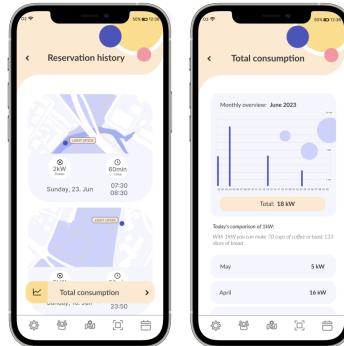


Figure 13: Booking history (left), consumption analysis (right).

4.3 Special effects and animations

1. **Timer for visualization of remaining time for already booked lights:** We have animated a timer, technically referred to as the "progress circle" which periodically expands to simulate how much time remains to re-book a lamp that has already been reserved. End users receive real-time feedback on the availability of different lighting systems



Figure 14: Timer visualization.

2. **Highlight momentarily reserved lighting:** With the help of a built-in "ripple animation", we create a pulsating effect of icons to highlight up-to-date personal bookings on the map. The torch icon immediately modifies its color to coral and begins pulsing to uniquely attract the user's attention.



Figure 15: Booked lamp pulsating.

3. **Illustration reacts to the rhythm of music:** If the user turns on the music function in the application and synchronizes music with it, the illustration reacts to the song's rhythm, altering the environment's color and pulsating elements simultaneously.
4. **Greet friends:** Customers may send their friends light signals to indicate their location by virtue of the application. To visually represent the action executed, the street lamp in the illustration begins to blink. In the fictitious scenario imagined, the lantern would flash equally in the real world to help target persons orient themselves.

5 Reflection

The ongoing iterative, non-linear process has enabled us to process feedback that has been played back to us during individual development phases and build it into our approach. This has also generated some ideas for further development of the app.

5.1 Conceptual challenges

1. **Light as a luxury good:** During the initial design process, the booking of the lamps was only possible with financial resources. However, this implied that the light created social injustice through the financial aspect and worked against social connectedness, which is our goal. Light should not be a luxury good and should be freely available to everyone. Because of this, the app should depend on other financial resources, but not those of the users.
2. **Social aspect:** It was important to us to develop an app that enables social spaces in public spaces. Since public space can be designed less by the individual for an occasion and thus promotes well-being, this was our main concern in the development.

3. **Security aspect:** It was important to protect sensitive safety-related information from misuse, which was especially important when creating an emergency option. We also had to consider uncontrolled takeover of the lamp by third parties or parallel use. So, firstly, we were able to put the coding of the location in case of an emergency on the side of the emergency center, which can decode the location of the lamp by a code. And secondly, introduced a booking system. We put aside the planned option to define the lamps in public places in case of discomfort due to the security aspect, in order to protect the emotional state of the user.
4. **Coherent user interface:** The feedback to pay attention to a coherent user interface was implemented during our various prototypes and we have now settled on a consistently, but still playful design.
5. **SOS simplicity:** The SOS button was embedded by us on the settings page at the beginning. However, in case of an emergency, the clicks to get there are too many and the original function of using it to contact the emergency is not realistic. To create the intuition and simplicity of the SOS button, we embedded it on the main page, where it can be opened effortlessly with one click on the app.
6. **Night sleep:** In order to keep the night's peace in public spaces, we have adapted the booking system of our app so that no lamp can be booked from 11pm to 9am.
7. **Frequency of use:** At the beginning of our idea, we had to face the feedback to develop an app that entails a frequency of use. Because we no longer focus on the single use of lamps in public space (e.g. in elevators), but on group events in public space and offer different modalities of lighting, the use is now more frequented.

5.2 Future app improvements

We want to address two aspects for the future improvement of the app that we believe will have the greatest impact on how the app is perceived and used.

In addition to the community aspect of creating an office atmosphere as a group in public space through light, the private aspect is an extension. Here, light should primarily ensure safety and well-being by illuminating routes to be walked, by connecting the route and mobile phone signal with the lamps along the route. In addition, closed spaces in public spaces such as elevators can be individually designed with light. It is important to note that it is not the light that is changed as the basic lighting, but that the light can be individually adjusted.

Since the app is to be hosted by the city, it is up to the city to give its citizens even more opportunities to design public space individually and, above all, to pay attention to sustainability. You could unlock a private mode for companies that could also control lights on their property. Allotments, schools, blocks of flats or social events can also take advantage of this offer so that only a certain intended group controls a group of lamps.

6 Conclusion

Zusammenfassung und was haben wir im Kurs gelernt (interdisziplinär und so)

7 Appendix

Figma prototyp: <https://www.figma.com/file/ihfvYYkg4Ki55qM6aQQSM1/Design-Workshop-2?type=design&node-id=0%3A1&mode=design&t=ZiQDVoFPeulSaAjA-1>

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