Ellow: The mobile application for electricity consumption

User study: Implementation of a control system to limit electricity consumption and cater for user disabilities

Master's thesis in Computer science and engineering

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Abstract

This project pursued the creation of a mobile application for managing electricity usage remotely for two distinct groups, the elderly and those with OCD. During the study, the focus narrowed to individuals with OCD. The mobile application is the creation of a system which acts as a controller, namely for reducing the electricity consumption within homes, with a special focus on people with OCD. The user was able to switch their electrical devices on/off when they were not at home. The application provided statistical data, on consumption over days, months, and years. A bar code "QR code" was connected to each electrical device. This was made to add the scanned device to the application. In the application, there was a feature that enabled users to have anonymous conversations with therapists and engage in chats with other users who share a common diagnosis of OCD.

The project carried valuable insights from an expertise group, in a company called R.I.S.E. Low and high-fidelity prototypes were done together with surveys, questionnaires, and usability tests. Interviews were conducted and the Swedish OCD Association discussions were recorded. To achieve success in the project, the team followed the five stages of the design thinking process: Empathize, Define, Ideate, Prototype, and Test. Each stage employed different methodologies and techniques to ensure thorough exploration and effective problem-solving. The project resulted in a mobile application, called Ellow.

User observations revealed the importance of easy-to-use mobile applications for both the elderly and individuals with OCD. Collaboration with psychologists enhanced the prototype, emphasizing the need for advanced features to address OCD concerns. Legal considerations highlighted the challenges in creating technology solutions for OCD, emphasizing the importance of evolving legal systems. Overall, the study emphasizes the significance of tailoring applications to diverse user needs and experiences in symptom management for OCD.

Keywords: Mobile application, QR code, OCD, electricity consumption, Interaction Design, disability.

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Firel Issa, Smedra Touma, May 2023, Gothenburg, Sweden

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1
Introduction

Inflation in Sweden was primarily impacted by measurement issues and altered consumption patterns during the epidemic, “2020 – 2022/2023”. Energy prices have caused the CPIF inflation rate to rise from 0.5% in December 2020 to 4.1% in December 2021. Leading to a turn in the instability of current electricity prices and the consumption of electricity (Riksbank, 2022). According to the Riksbank (2022), there is an impact of the climate transition on inflation and challenges that may have to be faced in the future to keep inflation low and stable. The main effects on inflation that may be expected: Higher energy prices; a negative effect on aggregate supply when carbon-intensive technologies are phased out; increased aggregate demand with investments in new technologies and a positive effect on aggregate supply when new technology is in use. The analysis is partial and focuses on the possible effects of the climate transition. Inflation may also be affected by other factors, such as climate change that has already occurred or will occur (Riksbank, 2022).

Load shedding is when there is not enough electricity to go around. This can happen when the price of things needed to make electricity, like equipment and workers, becomes too expensive. When prices are high, power companies may not have enough money to keep everything working well, so there may be more power outages. Load shedding is when the power company plans to turn off electricity in some areas to avoid a big blackout. There are different reasons why load shedding can happen, like when there are problems with the wires, or when it is hot or cold outside. When prices are high, load shedding may be needed to keep things from breaking and to make sure everyone has enough electricity (Endeavour Energy, 2020). Due to inflation and loss of resources, we have been heading closer to the load shedding system, which has already been implemented in many third world countries. Without intervention, even first-world countries could experience load shedding due to rising costs of equipment and labor, potentially leading to more power outages and scheduled electricity cuts. The strain on resources and inflation could push advanced economies closer to the load shedding systems seen in many third-world nations, underscoring the global energy challenges we face.

Jesper Kjeldskov, Mikael B Skov, Jeni Paay and Rahuvaran Pathanathan (2012), considered similar factors in the article “*Using Mobile Phones to Support Sustainability: A Field Study of Residential Electricity Consumption*”. The study was utilized to provide information to a user about energy consumption. This was an action towards mitigating the electricity consumption issues. In the study an application was created to test 10

different households during seven weeks, to gain a better understanding of electricity. This study did not provide any note towards disabilities, in this case, the design of the application was not considered to be user-friendly. This meant their purpose of helping all types of people was not solved (Kjeldskov, Skov, Paay & Pathmanathan, 2012).

Based on the factors presented above, the thesis project aims to assist different types of people in reducing their electricity consumption. To envision this project, the solutions will be implemented with the assistance of a mobile application. This makes it simple for the user to solve multiple problems, for instance, switching off the television remotely.

This thesis project consists of two complementary ideas, the first idea is about a system which acts as a controller for the electricity consumption within homes, apartments, or company buildings. The second idea is that the user would also be able to switch their electrical devices on/off when they are not at home. The controller device will be able to provide statistical data on the consumption over a period of months and years. A bar code will be connected to each electrical device. This will add the scanned device to the controller system.

In addressing the challenges of these two ideas it will be possible to gain valuable knowledge pertaining to the electricity prices for every household, company, and schools. The electricity has increased exponentially when compared to previous years (Statista, 2023). These two ideas will help with a reduction in unnecessary expenditure. The secondary nature of these two ideas is to be able to assist people with disabilities, like OCD, in their everyday lives.

1.1 Stakeholders

This section focuses on the target groups, design difficulties, focus area and disability group.

1.1.1 Elderly people

Physical ability declines with age, impeding elderly individuals' capability to adjust thermostats or turn off lights efficiently. Thus, reducing power consumption could be remarkably beneficial in making their homes safe and more energy efficient (Department of Energy Report, 2022). Technology can often be challenging for older people since cognitive impairment linked with ageing makes it difficult for them to comprehend technological processes (Mitzner et al., 2010). As affirmed by Czaja et al. (2013), problems such as memory errors can make using digital devices hard. The elderly find it difficult to manipulate tiny buttons due to hand dexterity issues or visual disturbances. An effective application for elderly people should have user interfaces navigable through simple mechanisms involving appropriately sized fonts and comprehensive directions.

1.1.2 People with OCD

Excessive consumption of electricity is a common occurrence among people with obsessive-compulsive disorder (OCD). This is due to their repetitive behavior and intense desire for orderliness. This conduct usually involves repeatedly checking switches on appliances and lights thus consuming more energy than necessary. To confront the challenge, it requires the deployment of energy-efficient practices into households (International OCD Foundation, 2021).

People living with OCD require precise monitoring capabilities regarding electricity consumption while demanding app interfaces that exhibit certain visual elements and behavioral features aligned with their predilections towards device usage (Grisham et al., 2011). Analyzing the habits of elderly persons or those living with OCD regarding electrical usage entails observing various aspects like lighting preferences, gadget options such as television/appliance choices, heating/cooling units use patterns for instance. Individuals exhibiting OCD tendencies are often seen practicing behaviors like turning off lights before leaving rooms or scheduling appliance utilization at specific intervals consciously owing to conscious energy control thoughts in general (International OCD Foundation, 2021).

1.1.3 Average consumers

An electricity consumption application initially designed with a focus on elderly individuals and those with OCD can offer valuable utility to average consumers as well. Inclusive design principles can ensure that the application is accessible and beneficial to a wider audience without specifying the features of the app (Smith & Brown, 2019).

The design simplicity that caters to the elderly can also enhance the user experience for average consumers (Smith, 2020). Visual usage reports that help individuals with OCD track their consumption meticulously can also provide insights and awareness to the average user (Jones & Brown, 2018). Customizable alerts and notifications, initially intended to meet specific needs, can also be adapted to serve the broader audience effectively (Anderson, 2019). Energy-saving tips and suggestions, a valuable feature for all users, can help average consumers reduce their electricity bills and environmental impact (Johnson, 2021). The remote-control capabilities, initially aimed at assisting the elderly, can offer convenience and control to average consumers (Davis et al., 2017). Lastly, robust data security and privacy features, crucial for all users, ensure that personal and energy usage data is protected and instil trust in the application (Garcia & Martinez, 2016).

By considering the needs of elderly and OCD users in its design, such an application can become a versatile tool that is user-friendly, informative, and secure, catering to a broader user base.

1.1.4 Design difficulties

Designing intuitive user interfaces for the elderly or individuals with OCD is no small feat considering their hyper specification when it comes to accurate data representation or personalized design preferences. To provide satisfactory solutions, a simplistic but accessible design based explicitly on said groups' requirements should be created. Particularly, crucial aspects are ensuring users' control over their confidential information as they remain wary of sharing it through technological means like controlling electric consumption via an app interface technology. Empowering control leads to better interactions concerning environmentally conscious living prospects (Czaja et al., 2013; Grisham et al., 2011).

1.1.5 Focus Area

After analyzing some of behaviors, through Grisham et al (2011), and user needs in this area, we have concluded a preliminary list of focus areas for the elderly and OCD:

- Energy conservation tips and strategies for reducing electricity usage while still maintaining a comfortable living environment.
- Home automation and smart technology solutions that can help monitor and regulate energy use, such as smart thermostats, motion sensors, and energy-efficient appliances.
- The environmental impact of excessive electricity consumption and ways to reduce one's carbon footprint.
- The financial impact of high energy bills and strategies for budgeting and managing electricity costs.

1.2 Goal

The two main challenges that will be undertaken during this thesis are:
1) Building a physical device or an application to control electricity usage.
2) Structuring the design to ensure compliance, security and welfare needs are met for individuals with disabilities.

For people with OCD, it is good to have a notification at a particular time, coupled with a GPS feature that recognizes when the user is moving outdoors. For example, when the elderly and OCD people leave the stove on after leaving the home, they will receive a notification to turn the appliance off from the application. Some other features would include a timer for the products that are used, such as TV and cooker hood, and a simple clear interface/solution for the elderly.

In this project, we will go through the engineering design processes that we have learned throughout our master education. These design processes include empathizing, defining, ideating, prototyping, and testing (Interaction Design Foundation, 2022). These

techniques will help define the processes of this project and complete the challenges presented. These design processes will also provide the methodologies which can be applied to interviews, storyboarding, and surveys, these are important for the justification and testing of the product with users.

The concept goal for this project is to decrease the costs of electricity by avoid paying unnecessary electricity bills, avoid fire hazards and lastly to help users with mental/health disabilities. The technical goal for this project is to design either an application or a physical device aimed at people with mental disabilities and the elderly generation. This application or device should be user friendly for those people.

Regarding the challenges of finding testers during the project, we have been in contact with the Swedish OCD Association, which has the task of supporting people with obsessive compulsive disorder (OCD) and related conditions (Svenska OCD förbundet, 2023). They had the possibility to publish a post that summarizes the idea of the project on Gothenburg's webpage to help us find testers. To find elderly testers we will contact some retirement homes and senior housing to get to know our users better.

Through the expertise group of Carolina Hiller, Hanna Hasselqvist and Maria Håkanssom from R.I.S.E the project will gain valuable insight into electricity technologies and research (RISE, 2022).

1.3 Problem description and research question

As mentioned, electricity prices have risen significantly, and this project aims to help people reduce their electricity consumption, and we aim to assist those with disabilities. To envision this project, the solutions will be implemented with the assistance of a mobile application or a physical device that makes it simple for the user to solve the problem, for instance, switching off the television remotely.

Therefore, the research questions we aim to answer are:

1. What should be considered when designing a device which controls and reads electricity consumption of electric dependent technology?

2. What are the implications of designing an energy control device for the elderly and people with OCD?

2
Theory

A theory section, including research papers about electricity consumption and electricity savings. It even includes related solutions about related papers, existing technologies, related applications and the law specified when testing with disability users.

2.1 Research Papers

This section includes research papers about electricity consumption and electricity savings.

2.1.1 Electricity consumption

Research paper 1
In the research paper "*Designing Effective Feedback of Electricity Consumption for Mobile User Interfaces*", Jacucci, Spagnolli and Gamberini (2015), talk about a system called Energy Life, which aims to help people save energy in their homes. Energy Life uses sensors and feedback to give information to the residents. The system is designed based on what research says is effective for giving feedback. There are two main things that are important: showing how much electricity is being used and giving tips on how to save energy. The design of Energy Life focuses on the users and goes through tests to make sure it is easy to use. The paper also describes the requirements for designing Energy Life based on what other research has discovered. It explains how these requirements are included in the mobile interface, which has a 3D carousel that is easy to understand, some of the usability requirements are: designing to avoid information overload, situated feedback, non-intrusive, intuitiveness, energy efficiency, and privacy.

The paper also talks about the first test they did to see how well people liked using Energy Life and the results of the test will help them improve the system and make a new version. With the requirements the study results showed adressing various aspects of an energy conservation feedback system, including providing feedback on positive and negative habits, behavior-specific feedback, sustaining user engagement, and improving feedback

quality. It also planned to address issues like accounting for energy use variations and enhancing context-dependent and personalized feedback. The study acknowledged usability challenges during testing, such as unintended menu openings and layout issues. The study aimed to create a user-friendly feedback system to promote energy conservation effectively. (Jacucci, Spagnolli, & Gamberini, 2015).

Research paper 2

In the article "*Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior*", Kollmuss and Agyman (2002) discuss the complexities surrounding environmental behavior that have been subjected to detailed analysis. Their article explores motivational aspects and hindrances impacting eco-friendly actions. As per their findings there are certain factors, like attitudes, towards nature conservationism, personal beliefs. The values that have contributed positively towards increased implementation of sustainable practices, while societal norms can act as powerful deterrents. Additionally, other challenges include the lack of required skills/knowledge, inconvenience and economical constraints. This directly influenced individual participation levels. To counteract this phenomenon the authors, recommend effective advocacy for sustainable measures using tools like educational programs, targeted marketing strategies and policy instruments.

Research paper 3

In the article "*A Smart Home Energy Management System for Household Appliances"*. Lin, Hsu, Tseng, and Tsai (2020), describe that intelligent thermostats and lighting systems can generate real time power consumption data, along with remote control functionalities. They assert that this solution has demonstrated potential for reducing utility expenses by reducing power wastage, while, simultaneously encouraging sustainable lifestyle choices among homeowners. Moreover, for individuals living with OCD who may experience anxiety or obsessive thoughts about how they consume power, the advanced monitoring and control capabilities offered through the technology could prove beneficial in providing greater peace of mind.

2.2 Related Solutions

This section introduces related projects and exciting technologies for people with OCD.

2.2.1 Related Papers

Related Paper 1

In the article "*Smart Energy Management Systems for Households: A Review*", Pandzic et al (2019) research ideas related to electricity consumption for people with OCD and developed Smart Energy Management System. This system uses sensors and artificial intelligence to track energy consumption in real-time and provide personalized energy-saving recommendations. The system includes features like automated lighting control, temperature management, and appliance scheduling to optimize energy usage. Pandzic et

al (2019) intends to present a thorough overview of the current research on SEMS, including the numerous processes that comprise implementing it and the results obtained in terms of conserving energy and customer satisfaction.

Pandzic et al (2019) identify many processes involved in system implementation, such as data collecting, data processing, and energy optimization methods. They investigate the efficacy of several SEMS (Safety and Environmental Management System) components, including smart meters, energy monitoring devices and home automation systems. Furthermore, the authors analyse the impact of user involvement measures on energy conservation, such as energy feedback and gamification techniques. The authors also discovered that including elements of competition, prizes, and social engagement can boost user motivation and encourage sustainable energy practices.

In addition, the authors discuss the problems and barriers to widespread household adoption of SEMS, such as privacy, data security, and system interoperability. To improve customer acceptability and happiness, Pandzic et al (2019) emphasizes the need of user-friendly interfaces, clear feedback mechanisms, and simpler installation processes.

Related Paper 2

In the article "*Interactive Energy Dashboards: A Review and Conceptual Framework*", Felder and Weinreich (2019) researched an innovative platform equipped with personalized graphs illustrating usage patterns over time. This was a helpful tip on how to conserve power while still meeting specific targets. In addition, users can set up alerts when their power consumption strays beyond predefined limits, making accountability easier than ever. Felder and Weinreich illustrate the work on interactive energy dashboards and provide a detailed assessment of current studies in this topic. By studying numerous features such as user interfaces, feedback mechanisms, and visualization techniques, the authors want to provide insights into the design and evaluation of interactive energy dashboards.

The authors begin by discussing interactive energy dashboards and their ability to encourage energy saving and behavioral changes between users. They stress the significance of offering consumers real-time knowledge of their energy consumption and the need for effective feedback mechanisms to encourage energy-saving habits.

The authors assess prior studies to determine essential components and characteristics that improve the efficacy of interactive energy dashboards. They investigate the influence of several types of representations, such as graphs, charts, and real-time feedback, on users' knowledge and engagement with energy use data.

The authors also emphasize the significance of individualized feedback and targeted advice in promoting energy conservation. They emphasize the importance of context awareness and user-centric design in providing users with meaningful and actionable information. The authors' research reveals that interactive energy dashboards can affect users' energy-saving practices. They discovered that providing real-time feedback,

customized recommendations, and appealing visualizations can help users better understand their energy usage habits and drive them to adopt more sustainable practices.

2.2.2 Related Applications

This section consists of two different type of related applications, namely applications for OCD and for electricity.

2.2.2.1 Related OCD-applications

These are three related applications for OCD with its advantages and disadvantages.

OCD.App – Anxiety Mood & Sleep

The OCD. App, Anxiety Mood & Sleep is a mobile app that provides support and resources for people with OCD. It includes features like a mood tracker, relaxation exercises, CBT tools, and a community forum for peer support. The app aims to help users manage symptoms, reduce anxiety, and stress, and improve sleep quality (OCD.App, 2023).

Advantages:

- Provides a variety of tools for tracking and managing OCD symptoms, including a symptom tracker, thought diary, and exposure and response prevention exercises.
- Offers educational resources and information about OCD to help users better understand their condition.
- Provides a platform for users to connect with others who have OCD and share experiences and support.

Disadvantages:

- The application may not be appropriate for individuals experiencing severe OCD or other mental health issues since it cannot replace professional treatment. Additionally, certain users may perceive the app's interface and design as obsolete or challenging to use.

NOCD

NOCD is a mobile app that offers therapy and support for individuals with OCD. It provides access to specialized therapists, self-help exercises, symptom tracking, and educational resources. The app helps individuals manage and reduce their OCD symptoms effectively (Treat My OCD, 2023).

Advantages:

- Provides a platform for users to connect with licensed therapists who specialize in treating OCD.
- Offers a variety of tools and resources for managing OCD symptoms, including exposure and response prevention exercises and mindfulness practices.
- Provides personalized treatment plans and progress tracking for users.

Disadvantages:

- This application may not be available to everyone since it costs money and not everyone can pay for it. Furthermore, some individuals may prefer to have therapy sessions in person (face to face) rather than using remote help from an app. Also, some people may feel uncomfortable sharing their personal data with an online therapist.

OCD TEST

The OCD Test app is a mobile application that helps users assess their OCD symptoms through a series of questions and assessments. It provides a self-administered screening tool to determine the likelihood of having OCD and offers feedback based on the user's responses. The app aims to provide a quick and convenient way for individuals to evaluate their OCD symptoms (OCD TEST, 2023).

Advantages:

- Enables users to self-evaluate their OCD symptoms and determine whether professional assistance is necessary promptly and conveniently.
- Delivers a thorough evaluation of both obsessions and compulsions associated with OCD. Offers resources and information about OCD to support users in comprehending their condition.

Disadvantages:

- Those who are suffering from OCD or other mental health issues should avoid using the app since it cannot replace expert therapy. The app's self-assessment function may not always deliver completely correct findings, which might lead to misdiagnosis.

Disclaimer: Each of these apps has advantages and disadvantages. OCD.APP and OCD TEST may be useful to understand more about OCD which was suitable and useful for this project. But, to have expert assistance, NOCD may be preferable. It is also beneficial to have a platform for discussing with others, and having a therapy part that could be included in our solution. Using these applications does not replace consulting a certified therapist or healthcare practitioner.

2.2.2.2 Related Electricity-applications

These are three related applications for OCD with its advantages and disadvantages.

Greenely

Greenely is a mobile app that enables users to monitor and manage their household energy usage. The app provides real-time data, personalized energy-saving tips, and the ability to set energy-saving goals. It also offers insights into environmental impact and allows for comparisons with similar households (Greenely, 2023).

Advantages:

- Real-time energy consumption monitoring: This application allows consumers to monitor their energy consumption in real time, allowing them to notice any odd increases and take the required steps to decrease their consumption.
- Personalized recommendations for energy savings: Greenely provide users with personalized recommendations for energy-saving based on their consumption patterns. This helps users to identify areas where they can reduce their energy usage and save money on their energy bills.
- Greenely enables individuals to discover places where they are using more energy than others and take proactive actions to reduce their consumption by analyzing energy usage with other users in their neighborhood.
- This application is simple and user-friendly. It has a basic and straightforward design that allows customers to effortlessly explore and utilize its functions.

Disadvantages:

- Limited availability: Greenely is currently only available in Sweden, which means that users in other countries cannot use the app.
- May not be useful for users who have already implemented energy-saving measures: For users who have already implemented energy-saving measures, the personalized recommendations provided by Greenely may not be very useful.

Tibber

Tibber is a platform or mobile app that provides smart energy management services. It offers features such as real-time electricity consumption monitoring, personalized energy insights, and the ability to control smart devices remotely. Tibber aims to help users optimize their energy usage, reduce costs, and make sustainable choices (Tibber, 2023).

Advantages:

- Real-time energy monitoring: The software allows consumers with real-time energy tracking, allowing them to track their energy usage and discover areas where they may cut back.
- Tibber provides a variety of energy-saving options, including the possibility to switch to cheaper electricity companies and connection with smart home devices like Nest thermostats and Philips Hue lights.
- User-friendly UI: The software includes an easy-to-use and navigate user interface.
- Cost savings: The software enables consumers to switch to less expensive energy sources, which can lead to substantial cost savings.

Disadvantages:

- People in other nations cannot use Tibber since it is only available in a few European countries.
- If someone is already paying a low energy rate, Tibber may not help them save much money.

El Priser

The "El Priser" app, available on the Google Play Store, provides information and features related to electricity prices. It offers real-time electricity price monitoring, historical data, price comparisons, and customization options (El Priser, 2023).

Advantages:

- Energy provider and pricing database: El Priser provides a complete database of energy producers and prices, allowing customers to compare different suppliers and discover the best bargains.
- User-friendly comparison tool: The app includes a user-friendly comparison feature that allows users to easily compare energy rates from various providers.
  Search result filters: Users can search and filter data by price, length of contract, and sustainable energy choices.

Disadvantages:

- El Priser does not give you real-time updates on how much energy you're using or suggestions on how to save energy like Greenely and Tibber do.
- The El Priser app can only be used in Sweden now, so people who live in other countries cannot access or use it.

The most useful feature of these three mobile applications that have been used in this project was that user-friendly feature. User-friendly features in a mobile app are designed to enhance the user experience and make the app easy to navigate and interact with. These user-friendly features collectively contribute to a positive and enjoyable user experience, making the app easy to use, navigate, and engage with. One more useful feature that has been used in this project was the real-time energy consumption monitoring feature. This means that this application will have a statistical data page that shows data over day, month, and year.

2.3 Swedish Law

In our pursuit of designing an electricity consumption application tailored to the needs of individuals with OCD, we conducted extensive legal research to ensure that our project adhered to all relevant laws and regulations. This section outlines our efforts to locate specific legislation and the responses we received from legal professionals and the Discrimination Ombudsman (DO).

Legal Research and Its Challenges

Our commitment to legal compliance led us to initiate a comprehensive investigation into the Swedish legal framework. We specifically aimed to identify regulations concerning user privacy protection, consent for using our software, and broader considerations related to technology in mental health applications.

The Absence of Explicit Legislation
Our diligent research revealed that Sweden maintains stringent privacy protection laws, primarily guided by the General Data Protection Regulation (GDPR). However, despite these comprehensive regulations, we encountered a significant challenge: the absence of explicit legal provisions addressing applications designed for individuals with OCD or other mental health conditions.

Consultations with Legal Experts
To ensure our project's legality, we engaged in consultations with legal professionals who specialize in technology and data privacy. Their expertise provided valuable insights into the existing legal framework and its applicability to our unique application. While they confirmed our adherence to Swedish law concerning data privacy and user rights, it became evident that the legal landscape had yet to encompass specific provisions for mental health applications like ours.

Insights from the Discrimination Ombudsman (DO)
Recognizing the need for a comprehensive assessment of our project's legal standing, we reached out to the Discrimination Ombudsman, DO (DO, n.d). In response, the DO conveyed that discrimination, as defined by the Discrimination Act, pertains to situations where individuals are disadvantaged or subjected to mistreatment due to specific grounds outlined in the law. These grounds include:

- Gender
- Gender identity or expression
- Ethnicity
- Religion or belief
- Disability
- Sexual orientation
- Age

However, it is important to note that the Discrimination Act does not encompass all sectors of society. It specifically applies to the following areas:

- Employment
- Education
- Labor market policies and employment services without public commissions
- Initiation or operation of business activities
- Professional qualifications
- Membership in certain organizations (employee organizations, employer organizations, or professional organizations)
- Trade in goods, services, and housing (outside of private and family life)
- Organization of public gatherings or events (e.g., concerts, markets, or fairs)
- Healthcare and medical services
- Social services, special transportation, and housing adaptation grants
- Social insurance system (services provided by the Swedish Social Insurance Agency)

- Unemployment insurance
- State study support
- Military and civilian conscription
- Public employment.

Our Commitment to Responsibility and Compliance

Although our research didn't uncover specific rules for our unique app, our discussions with legal experts and the DO reinforced our commitment to responsible and lawful development. These experiences emphasize the need for legal systems to evolve with emerging technologies, particularly in the mental health app sector. We're steadfast in our dedication to maintaining the highest ethical and legal standards throughout our project's development.

3
Methodology

Most of the methods that were used in this project were disputed according to the book Universal Methods of Design, Expanded and Revised (Hanington & Martin, 2019). This section aims to introduce these methods and the process in which they will be used.

3.1 Trello

To make the team's work easy and structured and to make it possible for them to see their projects visually, Trello has been used for this project. It offers a "flexible, visual method to manage anything with anybody," according to the company's website (Trello, 2023). Tasks can be created in Trello which provides more context and details, users can add labels, due dates, comments, attachments, and checklists. Teams can access the data they require from the Trello board within other applications thanks to Trello's integrations with other apps like Google Drive, Slack, and Dropbox. This will help smoothen the process of development by limiting the required application in use.

3.2 Design Thinking Process

Design Thinking puts users first when it comes to solving problems effectively. According to the Interaction Design Foundations definition of this approach, empathy experimentation and iteration are key factors in achieving success through human centered design thinking. The process consists of five sequential steps: Empathize; Define; Ideate; Prototype; and Test (Interaction Design Foundation 2022).

In step 1 "Empathize", during the Design Thinking process research will be done to understand the user's needs. In this step it's important to get to know our users and understand the problem (Interaction Design Foundation, 2022). For a more in-depth understanding of the challenges at hand, as well as their experiences and motivations, the designer might also wish to immerse himself in the users' actual physical environment (Dam, 2022).

In step 2 "Defining", the designers compile the data obtained during the Empathize stage. They then examine and synthesize the findings to define the fundamental challenges that have been uncovered (Interaction Design Foundation, 2022).

In step 3 “Ideate”, assumptions must be challenged, and innovative ideas must be generated. Here it is especially useful to start with brainstorming. To start the ideation method by ideating on the worst possible ideas, is frequently employed to encourage creative problem-solving. This makes it possible to start ideation by producing as many ideas as possible (Dam, 2022).

In step 4 “Prototyping,”, the goal is to find the best feasible solution for each problem that is discovered (Interaction Design Foundation, 2022). An example of prototyping is low-fidelity prototypes. These are another example of prototyping is High-fidelity prototypes, these are realistically detailed and similar to the final product in both appearance and functionality. Once there is a solid understanding of what to construct, a high-fidelity prototype can be then done. High- and low-fidelity prototype can be seen as sketches on Figma (Stevens, 2021).

In step 5 “Test”, it is time to try the product using methods such as usability task analysis. In this step the results will also be utilized to reframe one or more additional issues (Interaction Design Foundation, 2022). Examples of testing are qualitative and quantitative tests. Graphs and numbers are used to represent quantitative research. It is used to validate or put to the test beliefs and presumptions. A topic's generalizable facts can be established through this kind of study. Examples of quantitative research are experiments and surveys with closed-ended questions (Streefkerk, 2019). Another example of tests is qualitative research to comprehend ideas, thoughts, or experiences. Open-ended questions in interviews and verbal descriptions of observations are all examples of common qualitative research (Streefkerk, 2019).

3.2.1 Empathize

The Break-Up Letter

In the book “Universal Methods of Design Expanded and Revised”, Hanington and Martin (2019), describe the Love Letter and the Breakup Letter. These methods in interaction design enable people to express their sentiments about a product or service using a medium and a format that are immediately understood. By personifying a product and writing a private message to it, researchers can gain profound insights into the relationships people have with the products and services in their lives. The Love Letter reveals what people feel during moments of connection with a product, while the Breakup Letter provides insight into why people abandon a brand or product. Methods like the Love Letter and Breakup Letter build our empathic knowledge base of how people experience and personify designs and help us understand what creates moments of connection and delight (Hanington & Martin, 2019).

User observation

In the book “Experience Design: A Framework for Integrating Brand, Customer, and User Experience.” Hassenzahl, Diefenbach, and Laschke (2017), discuss the initial stage of the design thinking process. "Empathize" user observation is a commonly utilized research

method to obtain a comprehensive comprehension of user requirements, motivations, and behaviors. User observation is crucial in comprehending user-environment interactions, thereby uncovering valuable insights into user behavior, needs, and desires.

The central goal of such observations is to better comprehend how users interact with items within their day-to-day setting so that businesses might improve upon product design choices accordingly. During user observation sessions, it is crucial to prioritize the privacy and comfort of those being observed, an aspect emphasized by Hassenzahl et al. (2017). Moreover, designers should ensure thorough documentation of all observations to facilitate informed design choices and future research endeavors (Hassenzahl et al., 2017).

3.2.2 Define

The second step in design thinking is known as "Define." In this crucial stage designers examine data gathered prior with a view towards precisely defining their challenge or problem. In the article "*Change by Design"* by Tim Brown (2008), he asserts that clarity is a priority now as it provides much needed guidance throughout subsequent stages of development. Additionally, by leveraging earlier stages' empathetic insights designers can reframe problems strategically for enhanced outcomes.

Similarly, in "*The Design Thinking Playbook*" by Michael Lewrick, Patrick Link, and Larry Leifer (2018) the authors note that in the "Define" phase, designers "synthesize the findings from the empathize phase and develop a clear problem statement". The authors emphasize the importance of using a structured approach to define the problem and ensuring that it is well understood by all members of the design team.

Design thinking's "Define" phase concentrates on synthesizing insights gathered during "Empathize" stage and utilizing them effectively to identify problems requiring solutions. Various techniques are employed at this point to produce a straightforward problem statement that serves as a guide for future design endeavors.

Storyboarding
Storyboarding has become an integral planning technique utilized by creative professionals within various media sectors such as filmmaking, tv-production, animation. Instructional and Graphic Designers alike. A key aspect of this method includes lead practitioners sketching out illustrations, depicting every sequence of their narrative inclusive of camera angles, shot types and transitions, among others. According to Lee (2019) storyboarding serves as a pivotal design document which guides designers through efficient planning and seamless organization during the production cycle.

Scenarios
According to Hanington and Martin (2019), scenarios are narratives that describe a plausible future state in which a product or service might be used. The authors note that scenarios are often used in the design thinking process to "explore the user's needs, desires, and behaviors in a specific context". Scenarios can be created using different methods such as user interviews, field observation, and focus groups, among others.

The authors explain that scenarios can be presented in different formats, such as text, video, or visual storyboards, and can be used to communicate design ideas to stakeholders and team members. Hanington and Martin highlight that scenarios can be used in various phases of the design process, including phase 2 “Define” to help designers understand the problem space and develop a user-centered design solution.

Overall, the book "Universal Methods of Design" emphasizes the value of scenarios as a method for gaining insights into the user context and anticipating potential user needs or behaviors.

After the “Empathizing” and “Defining” steps, and after the knowledge gained through these studies, the next step for Ellow mobile application is to focus more on OCD people and make a solution that is suitable for their situation. Since OCD is the less focused target group when it comes to digital solutions that can help them in their everyday lives.

3.2.3 Ideate

Step 3 in the Design Thinking process is “Ideate”. According to Martin and Hanington (2019), the goal of the “Ideate” stage is to generate a wide range of ideas that could potentially solve the problem identified in the previous stage. This stage emphasizes the importance of quantity over quality and encourages free thinking and exploration of different options.

During “Ideate”, the design team engages in various idea-generating techniques, such as brainstorming, mind mapping, and sketching. These techniques are used to generate a large pool of ideas (Martin & Hanington, 2019).

Overall, this is a crucial step in the Design Thinking process as it allows designers to break free from conventional thinking and explore new possibilities. It sets the stage for innovative and effective solutions to emerge (Martin & Hanington, 2012).

Brainstorming
According to "Universal Methods of Design, Expanded and Revised" by Bruce Hanington and Bella Martin (2019), brainstorming is a method used in the design thinking process that aims to generate many ideas in a short amount of time. This group ideation technique encourages creativity and divergent thinking by setting aside judgment and criticism, and instead promoting the free flow of ideas (Hanington & Martin, 2019).

Brainstorming promotes collaboration, creativity, and a diversity of perspectives. By generating many ideas and encouraging open and free-thinking, this method can help teams to explore a wide range of possibilities and uncover innovative solutions to complex design challenges (Hanington & Martin, 2019).

Miro the digital platform offers all the necessary tools, and it made it possible to implement the brainstorming idea. Including a virtual whiteboard along with sticky notes, templates, and diagrams, needed for effective brainstorming sessions or efficient project planning. From design teams to educators worldwide have found success with this versatile platform. (Miro, 2023).

Pen and paper

A preliminary drawing made with supplies like paper, a pen, a pencil, or other comparable equipment is known as a paper and pen sketch or prototype. It is a quick and easy approach to explore and develop ideas for designs or products to provide a visual representation of their notions. This approach is low-tech and does not need any specific software or equipment, making concept iteration and refining simple. Also, it promotes flexibility and creativity since the designer is free to experiment with innovative ideas and make modifications without being constrained by the limitations of digital tools. (Hanington & Martin, 2019)

Low-fidelity prototyping

Low-fidelity prototyping is the process of creating simple and inexpensive representations of a design concept using materials such as paper, cardboard, foam, or digitally. This method enables designers to test a concept's functioning and usability early in the design process. It is frequently used throughout the ideation and iteration phases to produce and analyze various design concepts fast (Laurel, 2003).

Figma is a useful tool for creating the user interface and user experience for the application. This online tool also has collaborative features and an easy-to-use interface allowing for efficient design work and quick changes to the prototype. Additionally, the authors mentioned that Figma's prototyping capabilities allowed them to create a more interactive and realistic representation of the app's user interface and functionality (Figma, 2023).

3.2.4 Prototype

Prototype is the fourth step in the Design Thinking process (Bella & Hanington, 2019). This stage entails physically or digitally representing your ideas to test and refine them. Prototyping enables you to test various solutions and collect user feedback quickly and cheaply.

According to Bella and Hanington (2019), there are various kinds of prototypes you can produce from rough sketches or mock-ups known as low-fidelity ones to more advanced high-fidelity models that closely mimic reality. Overall, the Prototype step is important for the Design Thinking process because it enables to quickly iterate and refine the ideas based on user feedback and testing.

High-fidelity prototype

For product development, high-fidelity prototyping is a popular approach where designers craft a prototype that has advanced precision and performance like the product. This technique entails using actual interactive design components, enabling testers to evaluate the user interface and effectiveness of the product before it launches. High-fidelity prototyping in mobile application development entails building a digital prototype of a mobile application that closely resembles the end product's design and functionality. It may involve interactive components like clickable buttons and scrolling motions, as well as character simulations like data inputs and outputs. (Hanington & Bella, 2019)

The design of mobile apps for individuals with OCD may differ based on the individual's symptoms and needs. There are a few fundamental design concepts that can assist in making mobile applications more useful and accessible for individuals with OCD:

- A simple and regular interface can help minimize the amount of visual clutter and make it simpler for users with OCD to manage the application without getting overwhelmed. This might involve using the same font styles, color schemes, and button positioning every time.
- Clear and brief terminology: Utilizing straightforward language may minimize uncertainty and disorientation, which can be beneficial for people who have OCD and have intrusive ideas or repetitive thought processes.
- Minimal animations and visual features: Some people with OCD might discover that unnecessary animations or visual effects can be distracting or cause worry. Maintaining animations and visual effects to a minimum can help to alleviate a cause of anxiety.
- Individuals suffering from OCD who have needs or preferences regarding their symptoms may profit from customizable features such as the ability to change font size or color scheme.
- Clearly and apparent advancement indicators: When individuals with OCD employ the application, clear and visible progress indicators can help them monitor their progress and experience a sense of accomplishment.

Survey

The survey methodology is used to procure information from a chosen cluster of people via standard questionnaires in research tasks. When it comes to design thinking processes, surveys are an excellent method during prototyping stages where they give instant feedback on initial versions of products or services. By collecting quantitative data and insights related to prospective consumers/users, designers can efficiently enhance their products' quality and functionality with ease.

According to Brown (2009), while making prototypes for testing solutions through user feedback, this phase becomes quite critical. They suggested employing surveys to gather insights about what works well with stakeholders, envisioning improvements in their prototypes while constructing more iterations moving forward.

To illustrate this point further, i.e., when evaluating new mobile applications' functionality regarding medical devices, survey results would generate data on usability efficiency gains/losses among end-users across different contexts contributing comprehensively

towards refining future designs. Exercise can do wonders not just for our bodies but also our minds. A recent study involving one hundred participants showed that engaging in physical activity invariably led to better mental health outcomes. Specifically, individuals who exercised at least thirty minutes five times per week reported lower levels of anxiety and depression than those who did not workout consistently. Impressively enough though everyday tasks like taking walks or tending to plants were linked with enhanced psychological wellbeing too.

Questionnaire
In the book "*Business Research Methods*" by Bryman and Bell's (2019), a questionnaire is a data collection technique that entails utilizing a set of questions to obtain information from individuals or groups of people. This approach is extensively employed in various disciplines such as psychology, sociology, and market research, as it can gather both qualitative and quantitative data, depending on the research objectives.

Questionnaires can be administered in various formats, including paper-based, online, or through telephone interviews. The questions can be open-ended, closed-ended, or a combination of both. Open-ended questions offer more detailed and personal responses, while closed-ended questions provide more structured and easily quantifiable data (Bryman & Bell, 2019).

3.2.5 Test

Step 5 in the design thinking process is "Testing". During this stage, the design team evaluates the prototype they created in the previous stage to identify any issues or areas for improvement. "Testing" allows the team to gather feedback from users and stakeholders and refine the solution further before moving on to the final stage of implementation.

As stated in Tim Brown's book "*Change By Design*", testing is a crucial step in the design thinking process because it enables designers to "gather data, evaluate, improve, and iterate as often needed until you get it right." (Brown, 2008).

When testing is finished, the design group may utilize the input to implement any required modifications or enhancements to the prototype. After that, the updated prototype can be evaluated once more until the team is pleased with the answer.

Interviews
The Design Thinking process involves five steps but using the "interview" method is important during the last step. It allows designers to get inside the heads of users by fully understanding what they need (IDEO, 2015). Qualitative research methods such as interviews give designers an opportunity to converse one on one with users thereby collecting valuable data about them. During these conversations designers get an insight into user perspectives which can help design work from thereon (Grunert et al., 2015). The questions asked during an interview are usually open-ended, allowing for further exploration of certain topics while also allowing for free-flowing conversation between both parties involved.

Usability testing

During this stage, designers seek to grasp their users' needs and behaviors accurately. Usability testing is a user-oriented research methodology that involves checking up on a product or service by having users evaluate it while providing feedback for improvement (Nielsen, 2012).

Typically, a representative group of users tests the product or service while the designer notes down their behavior and feedback in real-time. Usability tests aim at pinpointing issues such as confusing navigation systems or unclear instructions, anything preventing users from accomplishing their goals smoothly (Nielsen, 2012). Depending on what is being tested, designers can conduct usability tests either remotely or in labs.

Usability testing provides invaluable insight into users' experiences which can help shape future steps within the Design Thinking process. Detecting weaknesses in addition to any potential issues related to usability enables designers to produce more proficient solutions that cater better towards users' needs as well as making them more accessible. Usability tests are paramount when evaluating products or services from a user centric perspective, it helps generate meaningful data required in making better informed decisions at all stages of the Design Thinking process.

4

Process and Development

This section describes the process and development of the phases in the design thinking process.

4.1 Determining new Target Audience

Completing the “Empathizing” and “Defining” stages of the design thinking process has provided valuable knowledge for Ellow: The mobile application for electricity consumption. The next step is to focus on individuals with OCD and create a digital solution that caters specifically to their needs. Unfortunately, digital tools that cater to this group are limited today. The proposed features should involve managing obsessive behaviors effectively while offering guidelines on anxiety management strategies through reliable resources such as support groups or professional counselors. If executed correctly, Ellow mobile app could transform into a tool that significantly improves both suffering individuals’ quality of life and offering familial support.

Designing an application for people with OCD and the elderly is challenging due to their unique needs. By following some of the strategies listed below one can develop an app that caters to both groups effectively:

- To ensure easy usability an easy to use and intuitive interface is crucial. The interface should have larger fonts that are easy to read along with clear and concise directions.
- Customizable features in meeting individual requirements. For users with OCD symptoms tracking compulsive behaviors or learning coping techniques can be beneficial while font size adjustments or voice commands can help improve ease of use for older users. Accessibility options like voice recognition or screen readers remove any barriers that users may face in accessing the app.
- Access to mental health experts and support groups through the app is critical for individuals struggling with OCD symptoms. Additionally providing emergency contacts or medication reminders would be highly valuable for elderly users. The utilization of these techniques in the development of a digital solution makes it practical to satisfy both individuals struggling with OCD and elderly citizens.

4.2 The implementation of Breakup Letters

Our initial phase involves implementing two methods, namely the Break-up Letter method and User observation method. This serves as an introduction to "Empathize", marking the first stage of design thinking wherein designers aim to comprehend users' objectives, behaviors, and desires at a deeper level. This empathizes phase facilitates insight into users' needs and motivations while also allowing us to better understand their behavior within contextual factors.

The Breakup letters were done from an elderly perspective and an OCD perspective, the letters highlighted the challenges they face and underscored the significance of prioritizing their well-being in relation to electricity consumption. By employing this method, the design process gained valuable insights into the specific needs and experiences of these user groups, guiding the development of solutions that address their unique requirements. See Figure 1.

Figure 1 illustrates the breakup letters. One from an elderly and one from an individual with OCD.

4.3 The implementation of User Observation

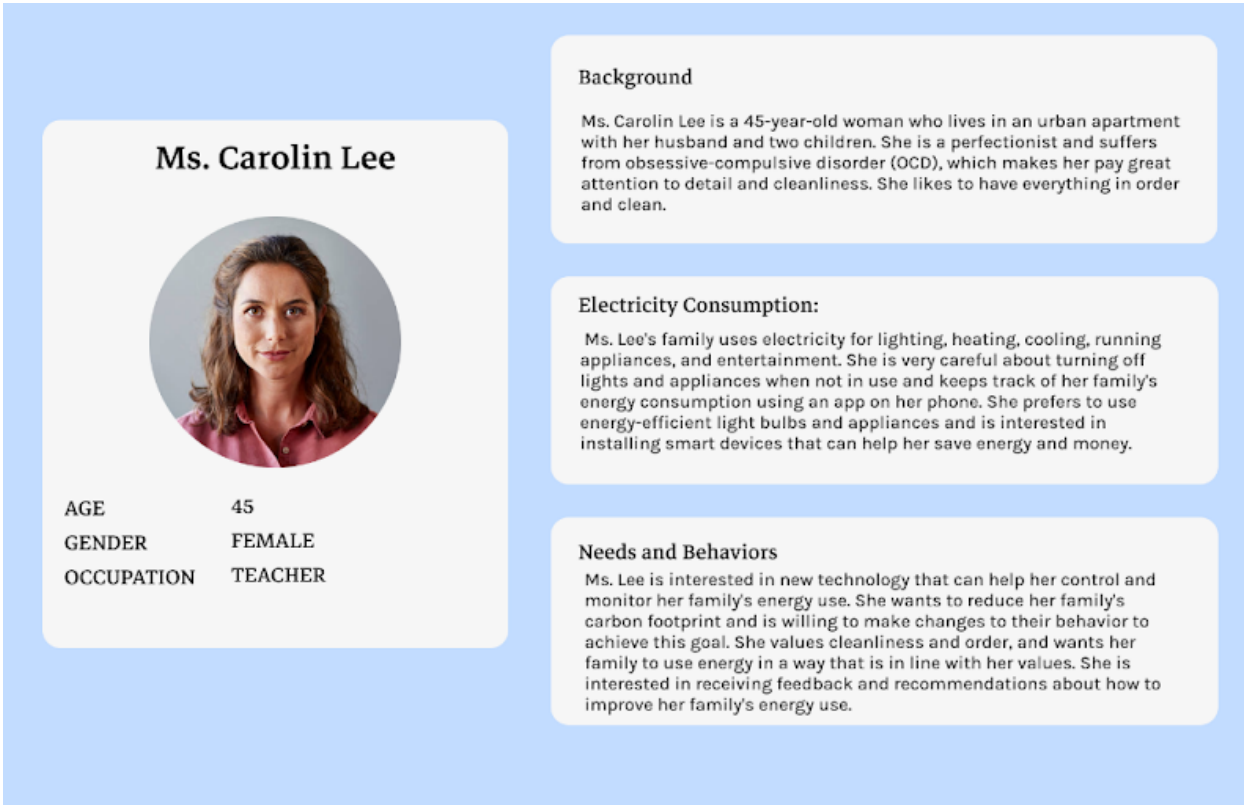
In the “Empathizing” stage, user observation was conducted for two target groups. The first group consisted of elderly individuals, for whom visits were made to retirement homes, their neighbors and other relatives. The meetings with the elderly participants

began with casual conversations to gauge their comfort level with using mobile applications and to understand any potential reasons for their hesitation in using such applications. The second part of the meeting focused on gathering their opinions on current electricity usage and whether an application could simplify their daily lives. Each meeting lasted about 30-40 minutes, and four volunteers participated in these observations.

In the context of the second target group, individuals with OCD, a distinct user observation approach was adopted, differing from that employed for the elderly group. Two experts with specialized knowledge in OCD were consulted to gather valuable insights into the unique experiences and challenges faced by this user group. In each meeting, which had an approximate duration of 20 minutes, the experts were given a concise introduction to the project idea. Open-ended questions were then posed to elicit detailed information regarding their behaviors and specific needs related to OCD. This user observation process aimed to deepen the understanding of individuals with OCD and inform the subsequent stages of the project.

4.4 The implementation of Personas

Two personas have been used in this project, namely one for a woman with OCD and one an elderly man. See Figure 2.



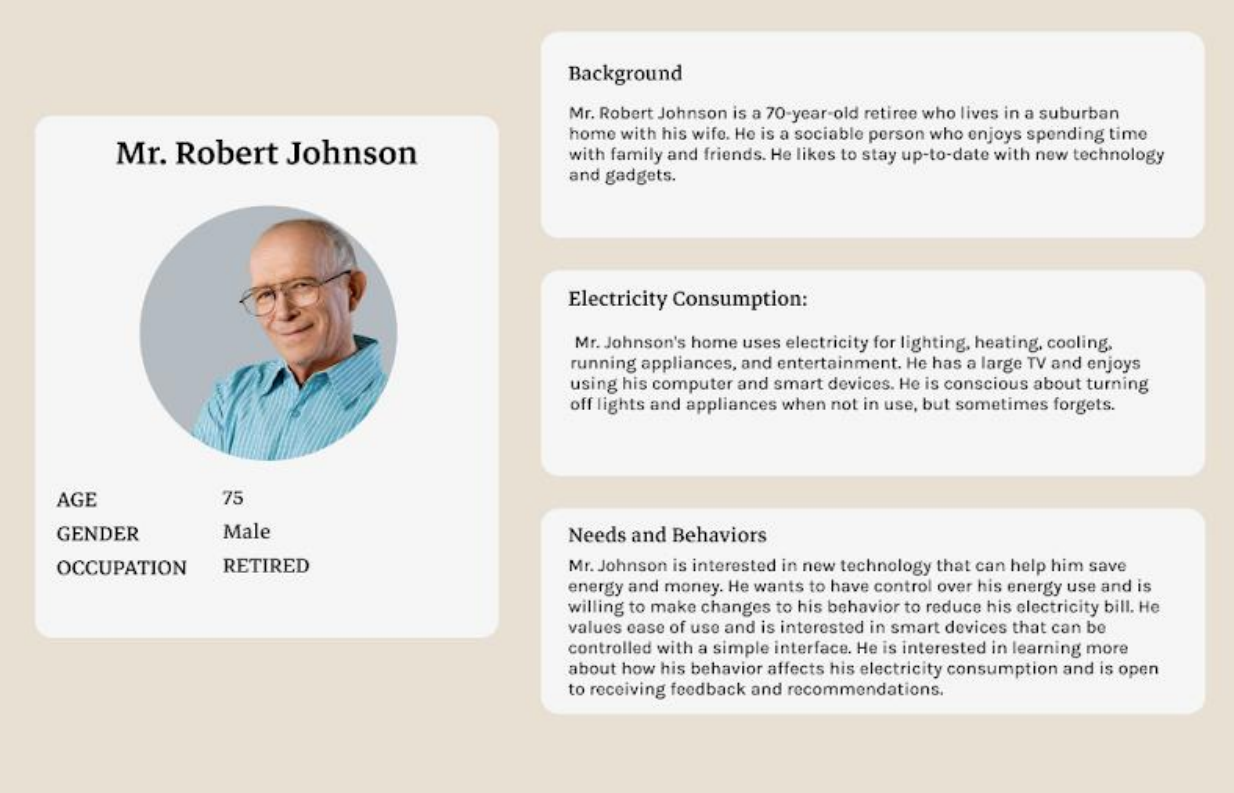


Figure 2 introduces the personas, one for an elderly and one for an individual with OCD.

4.5 The implementation of Scenarios

This section introduces two types of scenarios: initial scenarios and scenarios after interviews. Initial scenarios are developed at the beginning of the design process to understand user requirements. Scenarios after interviews are formulated after interviews and represent the refined design of the application.

4.5.1 Initial Scenarios

Scenario 1: Managing Energy Costs and Comfort for an Elderly Individual. See Figure 3.

Mr. Johan Andersson is an elderly retiree of 78 years old who resides alone in a remote rural property. While desiring comfort inside of his home, Mr. Andersson also desires minimal energy expenses for himself as well. Thus, he sets out on a mission to attain these objectives through the management of energy costs.

While reviewing one of Mr. Andersson's monthly electricity bills which seemed unusually high one month; resulting in inspiration for inspecting current power practices with intent on making changes towards cost-saving opportunities within the same area/space.

For finding sustainable solutions for managing expense as well as keeping comfortable living standards at said location; therefore, the decision was made by researching multiple

technologies finally leading towards adoption of Ellow smart application due due being best-suited when it came down controlling heating/cooling tools alongside overall electrical power distribution outlines. Improved heating and cooling preferences were just a few keystrokes away for Mr. Johan who installed Ellow with ease and began using its sophisticated features which included automatic temperature adjustments via scheduling when not at home or asleep during nighttime hours. The impact?

After putting Ellow into regular use, Mr. Johan found himself saving significantly on energy costs due to optimization settings aimed at balancing comfort with consumption efficiency. This meant always being able to enjoy steady temperatures adjusted according to his desired specifications without ever having the need for any manual intervention throughout day or night routines! Mr. Johan couldn't be happier with his choice to get Ellow installed and looked forward to discovering other energy-saving technologies that could make a difference in his home life experience. See Figure 3.

Figure 3 Shows the Scenario 1.

This is the script for the first initial scenario:

- Johan is 78-year-old. He is concerned about his energy bills and wants to keep his costs low.
- He receives his monthly electricity bill and notices that it is higher than usual.
- I found different options of mobile applications that can be useful for you but let us select a smart one that is easy to use and can be controlled from your smartphone.
- Ellow is the best application for me! My grandson taught me how I can set my heating and cooling preferences. I also can set up a schedule to automatically adjust the temperature when I am not at home or during the night when I am sleeping.
- The bill has gone down. It also feels more comfortable in my home because the temperature is always set to my liking, and I do not have to worry about adjusting it manually.

Scenario 2: Managing Energy Consumption with OCD. See Figure 4.

Lisa installed Ellow as an excellent tool for monitoring and controlling electrical usage in her household remotely. This app helped alleviate some of the strain on her anxiety since she could rest easy knowing everything was under control when she was not physically present at home.

Ellow provides Lisa with real-time data concerning her home's electricity usage whilst offering remote control capabilities over all home appliances including lighting fixtures and temperature controls; this feature gives her a sense of security without the need for continuous tactile manipulation of physical switches and knobs.

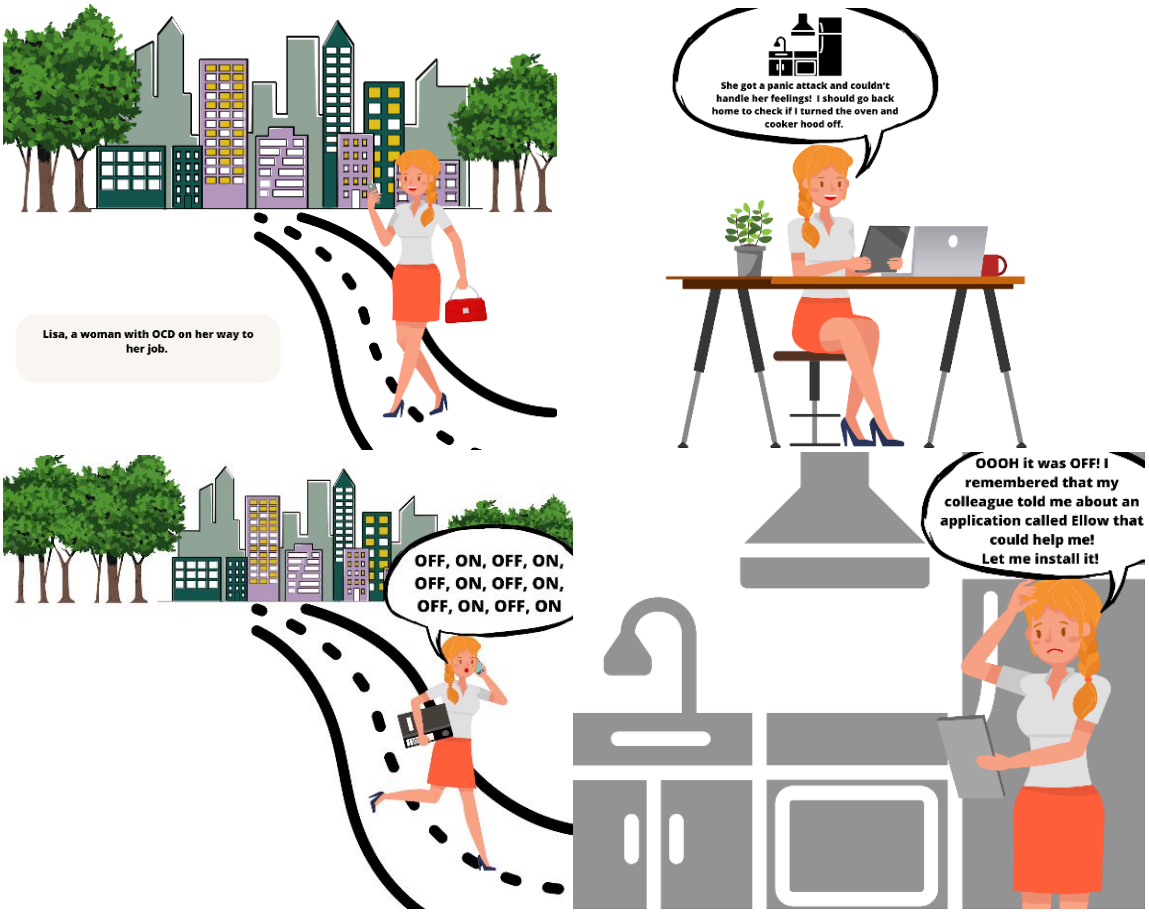
To remain within budgeted energy thresholds, Lisa has programmed automatic schedules using Ellow's mobile application; these schedules have been set up to activate daily

activities such as lights turning off at specific times each day or adjusting temperature controls automatically based upon usage throughout specific sections of a day.

The app will notify users if there are any discrepancies relating to unusual energy consumption levels or possible technical faults with devices. By utilizing Ellow technology, Lisa gained confidence in personal routines that lessen anxiety-related concerns regarding household electronics maintenance.

While challenges may arise on occasions where anxiousness peaks its head, trusting pre-established personalized routines supported by innovative technology remains key factors in reducing stress over electricity management requirements. Lisas reliance on automatic schedules and self-imposed regulations to maintain her household's electrical usage provides a sense of peace of mind knowing that everything is under control. Using her smart mobile application from anywhere further amplifies this feeling of convenience particularly when dealing with OCD related anxiety.

The case study exemplifies how utilizing such modern technological advancements facilitates individuals struggling with OCD to manage their fears while lowering their overall energy consumption levels simultaneously. Adopting automated schedules coupled with real time monitoring means that there are fewer dependencies on fixed routines or regular physical inspections. See Figure 4.



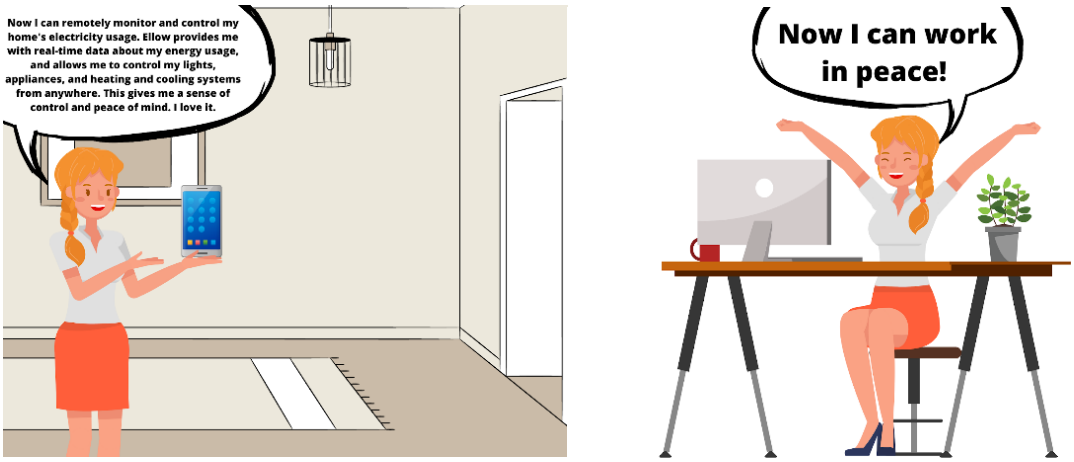


Figure 4 shows the Scenario 2

This is the script for the second initial scenario:

- Lisa, a woman with OCD on her way to job.
- She had a panic attack and could not handle her feelings! I should go back home to check if I turned the oven and cooker hood off.
- Off, on, off, on, off, on, off, on, off, on, off, on, off, on, off, on...
- Ooohh, it was off! I remembered that my colleague told me about an application called “Ellow” that could help me! Let me install it!
- Now I can remotely monitor and control my home’s electricity usage. Ellow provides me with real-time data about my energy usage, and allows me to control my lights, appliances, and heating and cooling systems from anywhere. This gives me a sense of control and peace of mind. I love it.
- Now I can work in peace!

4.5.2 Scenarios after interviews

Scenario 1:
John battles OCD related concerns regarding his electricity consumption patterns, which often leads to higher bills. Despite using energy-efficient equipment and being mindful of turning off devices before leaving a room or house, his anxieties persist. To alleviate these fears surrounding high bills, John avails himself of the Ellow mobile application. This app supplies masterful information regarding energy consumption patterns coupled with options to remotely power down specific electrical equipment even when not at home.

By selecting "Home" within the application's tab bar, it displays all registered rooms holding different electrical gadgets, John chooses which room needs better control over energy usage for their appliances, turning them off accordingly. Furthermore, thanks to Ellow's versatility users like John have the capability of continually adding new rooms or electronics at any point in. For John, managing OCD-related anxiety about his electricity bill is made easier by using a mobile app. By displaying how much energy he’s using, the app allows John to identify areas where adjustments can be made to reduce consumption.

As someone who enjoys working towards specific objectives, being able to set goals and track progress through the application helps stimulate continued reductions in usage.

Ultimately, feeling empowered through these lower consumption figures gives John a sense of achievement that lowers anxiety levels regarding bills. See Figure 5.

Figure 5 Resulted scenario 1.

This is the script for the first scenario after interviews:

- Please God help me! This is too long a bill! I must reduce my energy usage as much as possible! I must be able to turn off devices when I'm not at home! Please God, how can I do that?
- Yeees, I found it! This app "Ellow" that my cousin recommended can work perfectly! Let us try it and see if it has a feature for turning devices!!
- Wait, this is perfect! This wonderful app gives an opportunity to me to turn off specific devices that were on when I am not at home. In the "Home" icon the application's tab bar, I can scroll between different devices. I can choose the specific registered devices. I can choose the specific room that I want to have control over, and then I can turn off the specific device from that room. I also can add more rooms and devices.
- This amazing mobile application for electricity consumption helps me to manage my OCD-related anxiety around my electricity bill and makes me

feel more empowered and in control of my energy usage. I can take concrete steps to reduce my energy usage and save money on my electricity bill, which gives me a sense of accomplishment and reduces my overall anxiety.

Scenario 2:
Sophie has always cared earnestly for ecological sustainability, but having OCD makes everything related to cleanliness an issue of constant concern for her, including how much power gets consumed every day by various electronics at home or work. Enter Ellows, an easy-to-use mobile application and monitoring device designed precisely for scenarios like this one! Using Ellows through its various features Sophie can monitor her daily electricity usage and track it over a longer period (a week, month, or even whole year as she pleases). The app also lets her set goals for herself for how much energy is consumed in a day or week and keep tabs on her progress with an icon titled "statistical data" present in the tab bar. Ellows is clearly an excellent tool that Sophie has found quite useful in managing anxieties related to OCD and energy consumption.

For Sophie, being able to establish targets and monitor their progress using the electricity consumption mobile app is quite satisfying. It instills in her a sense of achievement which further drives her motivation to reduce energy consumption. In addition, the app helps soothe Sophie's anxiety linked with OCD and electricity usage by allowing her greater control over the environmental impact she has. See Figure 6.

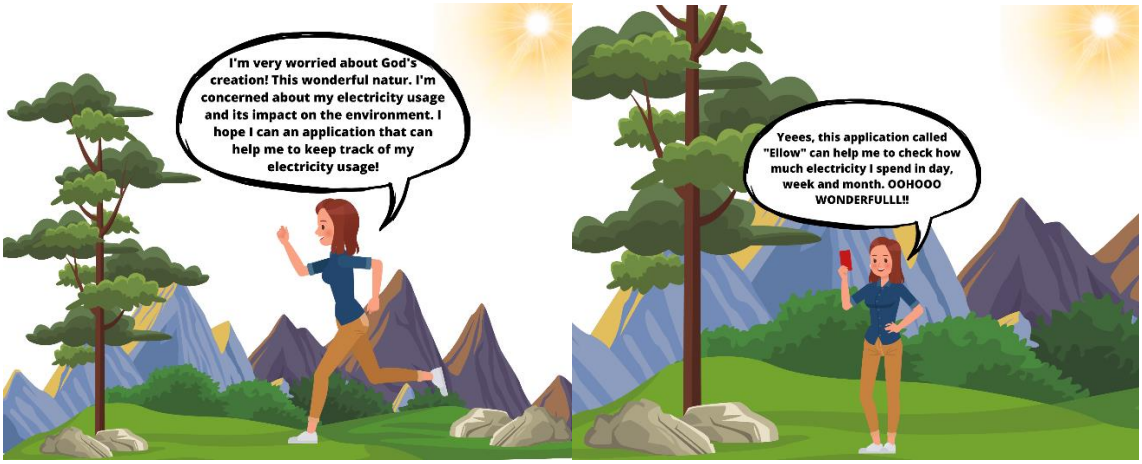


Figure 6 Resulted scenario 2.

This is the script for the second scenario after interviews:

- I am very worried about God's creation! This wonderful nature. I am concerned about my electricity usage and its impact on the environment. I hope I can install an application that can help me to keep track of my electricity usage!
- Yeees, this application called "Ellow" can help me to check how much electricity I use in day, week, and month. Ohoo wonderful!!
- Here in the "statistical data" icon in the tab bar, I check the statistical data for any day, month, or year, and see how much I consumed during them! I can also see "Most consumed devices!!" Amazing.
- This mobile application for electricity consumption helps me manage my OCD-related anxiety around electricity usage and makes me feel more empowered and in control of my environmental impact.

Scenario 3:

Alice struggles with OCD symptoms that make it difficult for her to feel comfortable about how much energy she uses at home. Anxiety sets in when she considers whether she may have left lights or electronic devices powered up while away from the house. To allay these concerns, Alice turns to "Ellow," a mobile app designed specifically for individuals like herself who face similar struggles managing electricity usage effectively.

The application facilitates real time monitoring of power consumption patterns with alerts that help Alice stay on top of her usage. Additionally, it provides access to qualified therapists and specialists who are experts in dealing with OCD. Alice can communicate openly with these professionals to address any underlying issues related to her energy use worries.

The app even includes a chat function for anonymous individuals who share similar concerns about using energy in the most efficient way possible. Alice has discovered that managing OCD-related anxiety surrounding electrical usage in the home can be made simpler with the Ellow app. With this innovative solution, monitoring exact energy usage

is easy as well as controlling devices remotely even when out of the house, providing peace of mind wherever she goes.

Moreover, by connecting with professionals through Ellow's built-in therapy features or chatting with others who have dealt with similar challenges using this application helps manage other aspects related to an OCD diagnosis, reducing stress levels significantly! Overall, this comprehensive toolset empowers Alice for better symptom management and improving overall well-being. See Figure 7.

Figure 7 Resulted scenario 3.

This is the script for the third scenario after interviews:

- Please, I need help with my anxiety!! My electricity usage has increased a lot recently!! I need therapy for this, speak to specialists or psychologists to help me with this anxiety!!
- Yeees I found it!! This app called “Ellow” has a feature where I can connect with licensed therapists and specialists who are trained to help individuals with OCD. In addition to therapists and specialists, the app also allows me to stay connected with anonymous people that have the same problem as me and chat with them to get more experience.
- Licensed therapists and specialists who are trained to help individuals with OCD.
- Ellow mobile application for electricity consumption helps Alice manage her OCD-related anxiety around home’s electricity usage and makes her

feel more in control of her electricity usage. The app’s feature of connecting with licensed therapists and specialists, as well as the helpful chatting with experienced people, provides her with a comprehensive toolset to manage her symptoms and improve her overall quality offer.

4.6 The implementation of Affinity Diagram

The affinity diagram was a method that helped organize and synthesize the data and ideas into common themes and categories in this project. This technique involves recording each idea or data point onto a sticky note or card. Grouping the sticky notes or cards based on similarities or patterns. Labeling each group with a category and theme that represents our ideas. This method was useful for identifying patterns and themes that may not be immediately obvious, and for generating insights that can inform further design and decision-making processes. The grouped themes helped us to see the importance of each category and helped to choose between different main function, as the notification in reminder and control category. The affinity diagram in Miro resulted in 11 themes, each one of them was crucial for the development of the project idea. By synthesizing the data into distinct themes, the affinity diagram facilitated a holistic view of the project's requirements, enabling the team to address each theme effectively and create a well-rounded solution, see figure 8.

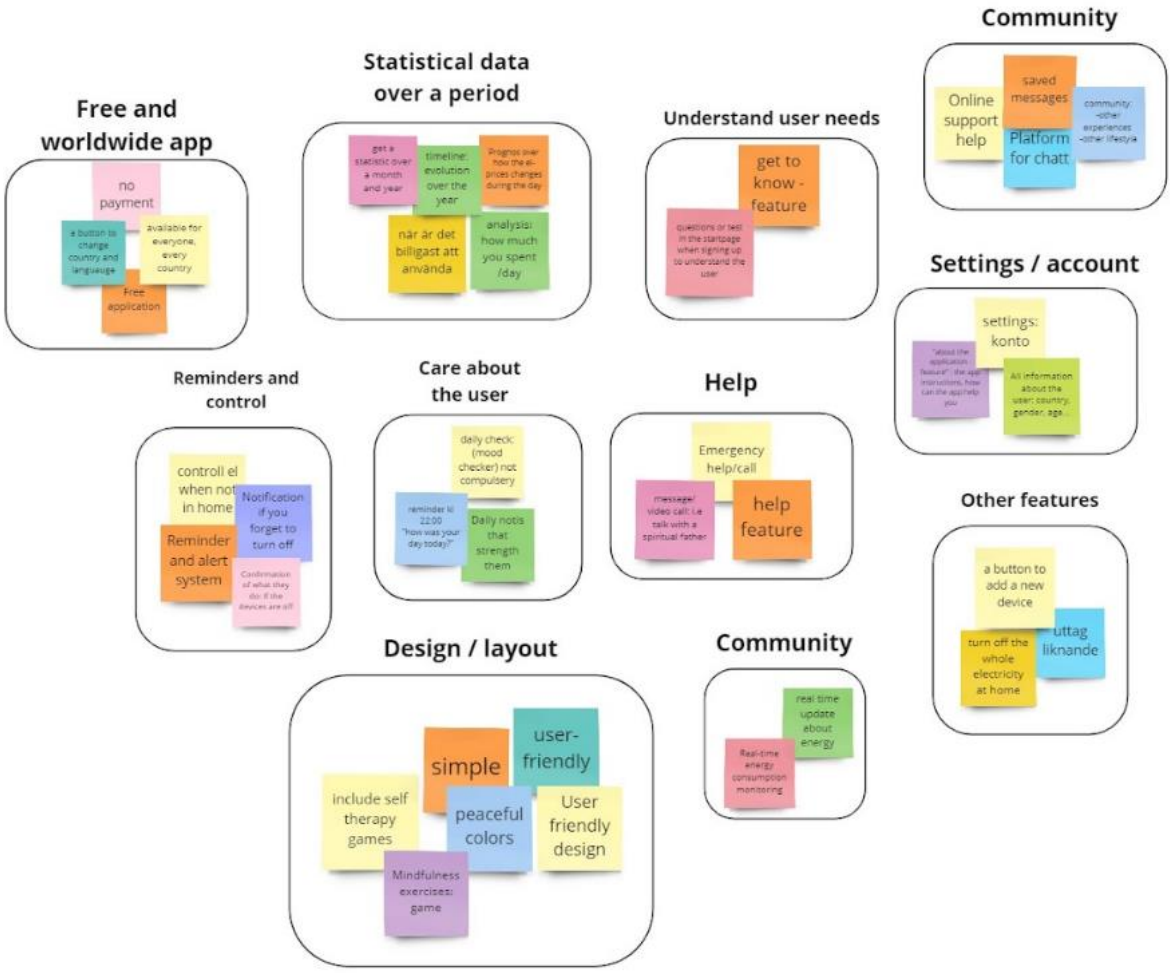


Figure 8 illustrates the Brainstorming in Miro, sorted as affinity diagram.

4.7 The implementation of Pen and Paper Sketching

Pen and paper sketching has been a useful tool in this project for many reasons:
Idea Generation: Sketching allowed us to quickly explore and generate ideas. By using a pen and paper, we could freely sketch different concepts, layouts, and structures without the limitations of software tools. Rapid Iteration: Pen and paper were great for rapid iteration and quick refinements. It was easy for us to adjust, erase and redraw elements, and experiment with different variations. This speed and flexibility allowed us to explore multiple design options efficiently. Problem Solving: Sketching allowed us to visually analyze and solve problems. When faced with complex challenges, sketching could help us break down the problem into smaller components, identify patterns, and explore potential solutions.

The initial stage of pen and paper sketching involves a primary screen with two key features: electricity control and statistical data. In the tab bar menu, there are options for home, therapy, and profile. When a user selects the electricity control feature, they are directed to a screen where they can designate various rooms, such as the kitchen or bathroom. Each room comprises different devices that users can manage. For instance, in the kitchen, there are appliances like the oven, cooker hood, and kettle, each controllable via switches. Users also have the flexibility to add additional devices as needed.

Furthermore, there's an option to turn the entire kitchen on or off using a master switch. See figure 9.

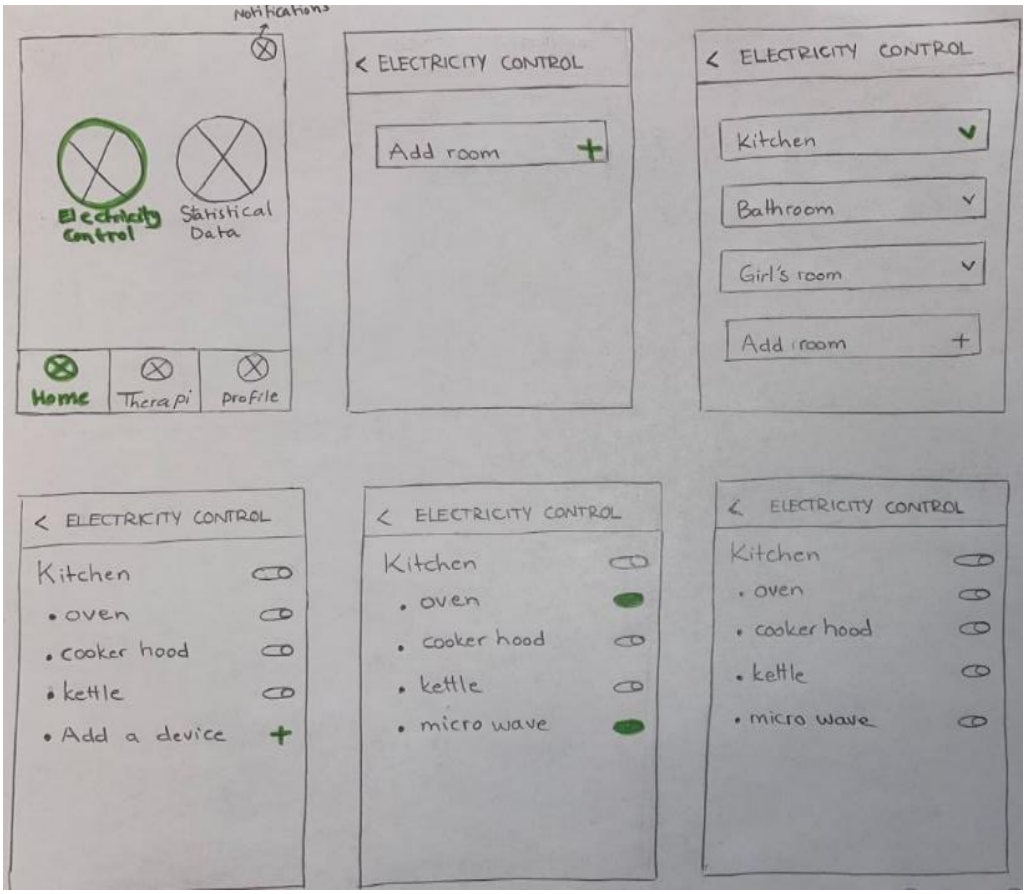


Figure 9 The initial screens of the pen and paper sketching

Figure 10 showcases a screen that offers users the choice of selecting "statistical data." This category comprises two subcategories, namely "data over month/year" and "spot prices." By opting for the former, users can view a graph illustrating electricity consumption and costs on a monthly or yearly basis. Conversely, choosing the latter will provide exact electricity cost details for their selected hour within the application.

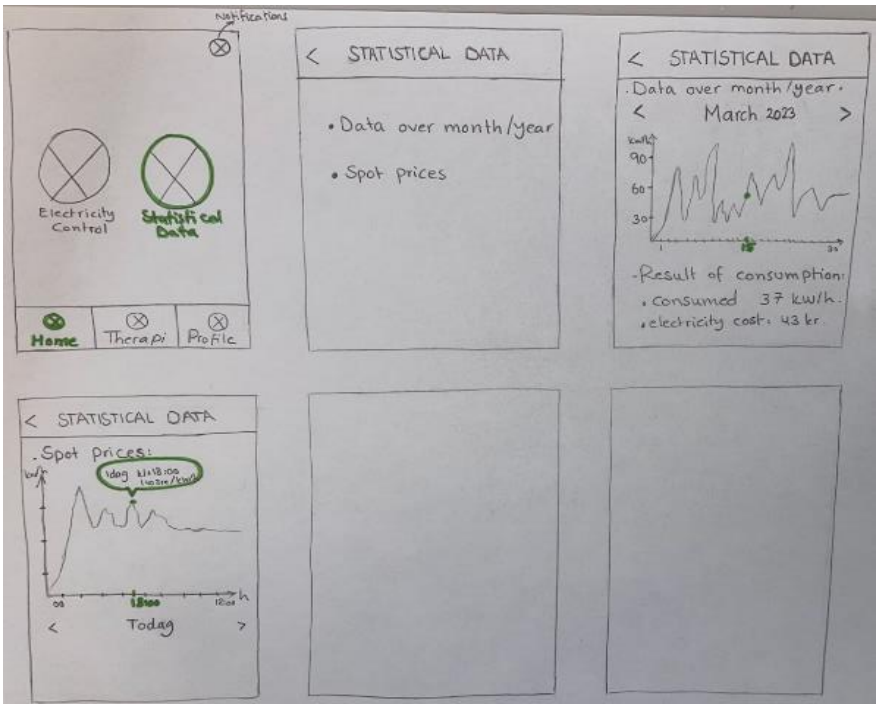


Figure 10 Statistical data

In the second option on the tab bar, when the user select the "therapy" section, they have several choices. They can make free calls or video calls with psychologists and therapists. They can also engage in chats with other users or listen to recorded meditation sessions. If the user chooses to make a free call, they will see a list of therapists, each with a call function next to their name. Additionally, there's a chat function where they can communicate with other members and access a list of recorded meditation sessions for your convenience. See figure 11.

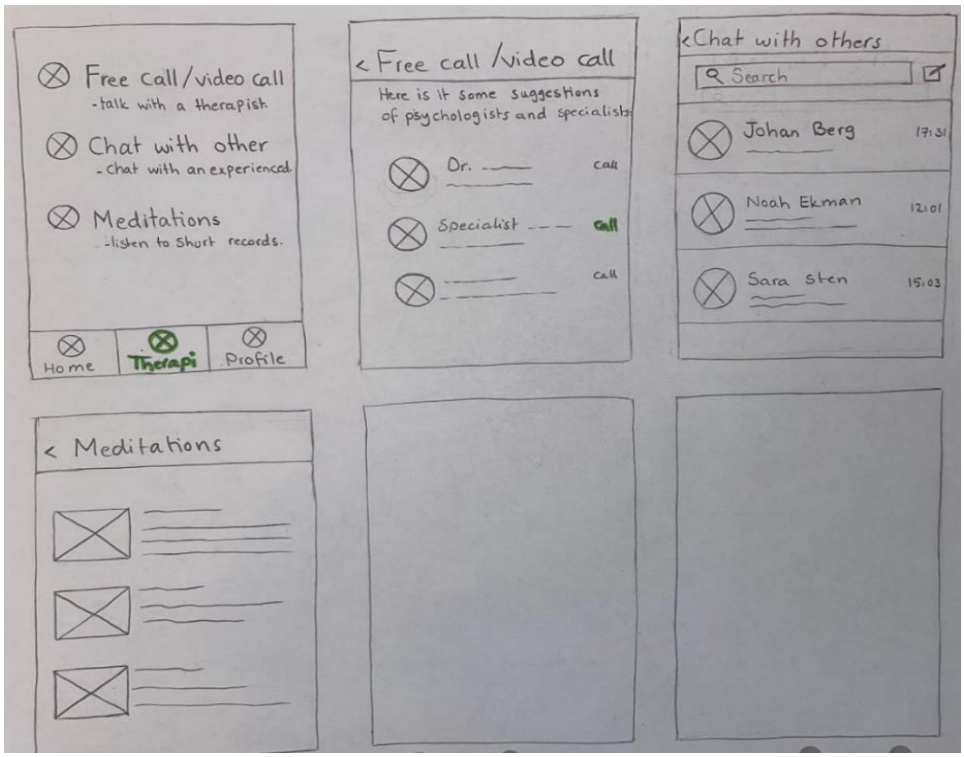


Figure 11 Is showing the therapy option in the tab bar.

The last option on the tab bar is labelled as "profile." Within this section, users can access their personal information and view the homes they have added. Additionally, there is an option titled "I will move" which allows users to modify or delete a home's address. Moreover, within the profile section itself, one can change passwords and adjust language settings for the application. By clicking on "My homes," users can add new locations and easily switch between different residences if multiple ones exist. Referencing figure 12 reveals more details concerning these functionalities.

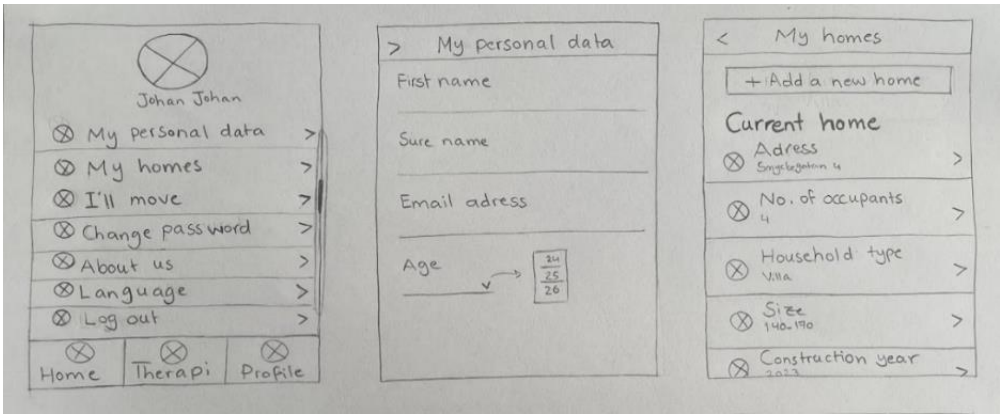


Figure 12 Profile section.

4.8 The implementation of Low-fidelity Prototyping

The mobile application presents a primary interface that offers the user a choice between two distinct options, namely the capability to control their household appliances remotely and the ability to view statistical data related to their energy consumption and usage patterns. This initial page serves as an access point to the application's key features, providing users with a clear and concise overview of what they can expect to find within the application. By emphasizing these two main options, the interface seeks to enhance user experience by allowing them to easily navigate to the functionalities that they require.

The low-fidelity prototype closely resembles the pen and paper sketching. On the homepage, users are presented with two options: electricity control, the button in the first screen on the left and statistical data, the button on the right. When the user selects the "electricity control" button, they can add rooms and view the various rooms, including the kitchen. Here, they have the capability to turn devices on and off as needed within each room. See figure 13.

Figure 13 Home page in the low fidelity prototype.

The second option is "statistical data." Here, users can choose to view either "data over the month" or "spot prices." See Figure 14.
- Data Over the Month: This option displays electricity consumption for each month of the year and the corresponding cost.

- Spot Prices: Users can see the hourly prices for each day using this option.

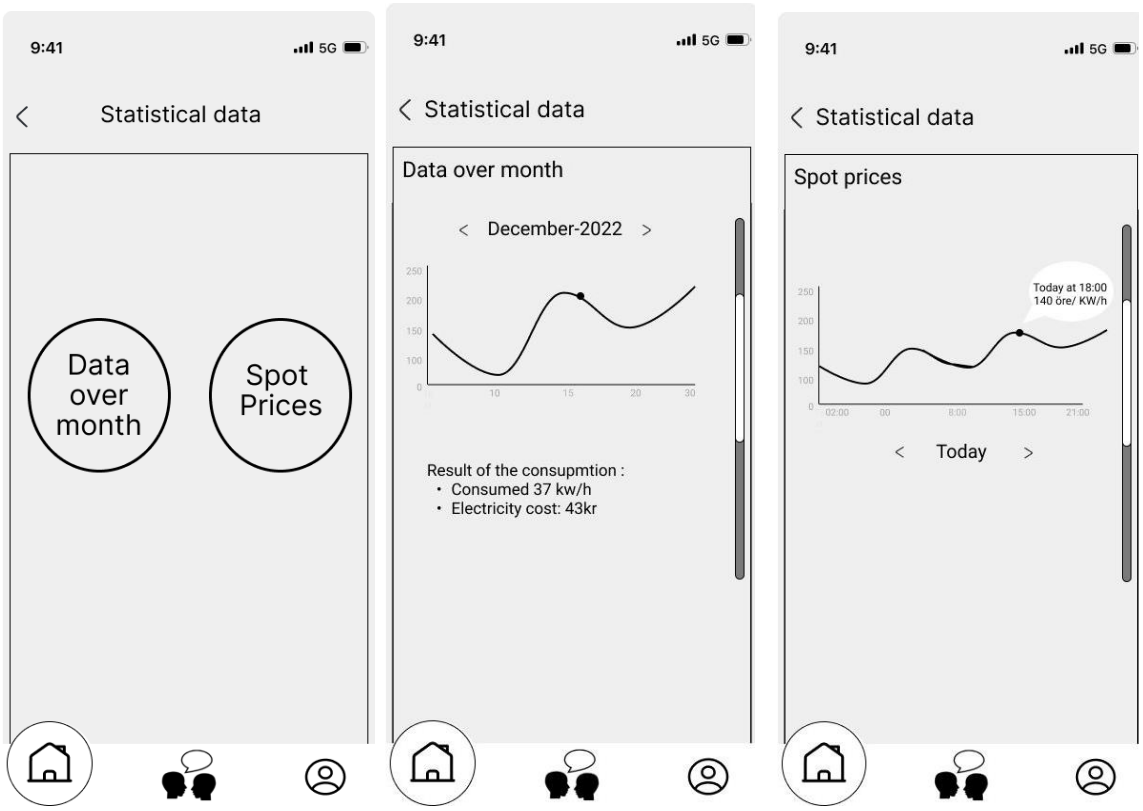


Figure 14 Statistical data in home page

In the low-fidelity prototype, the "therapy" section is positioned in the middle of the tab bar. See Figure 15. Here, users can access various features:

- Notifications: Users can check notifications in this section.
- Professional Calls: Users have the option to make calls to professional therapists and psychologists.
- Chat: Users can engage in chats with other users.
- Meditations: Users can also listen to meditation sessions.

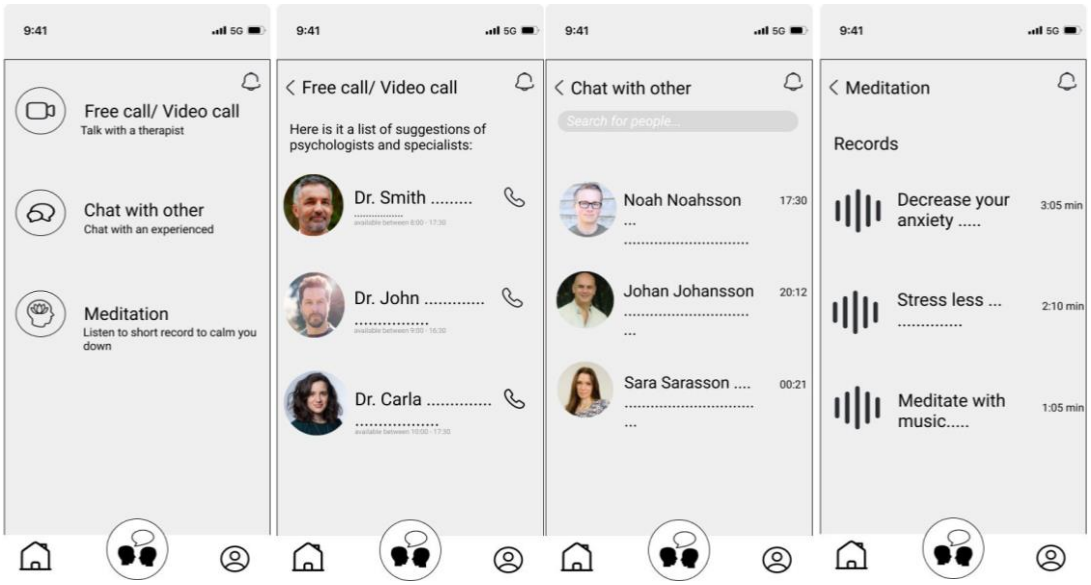


Figure 15 Therapy screens

The profile section allows users to manage their personal information. Here, users can:
- Adjust personal data
- Change their profile picture
- Review saved homes
- Modify their address and password
- Change the language of the application

Additionally, in the "My homes" section, users can add multiple homes for convenient control and easily switch between them. See figure 16.

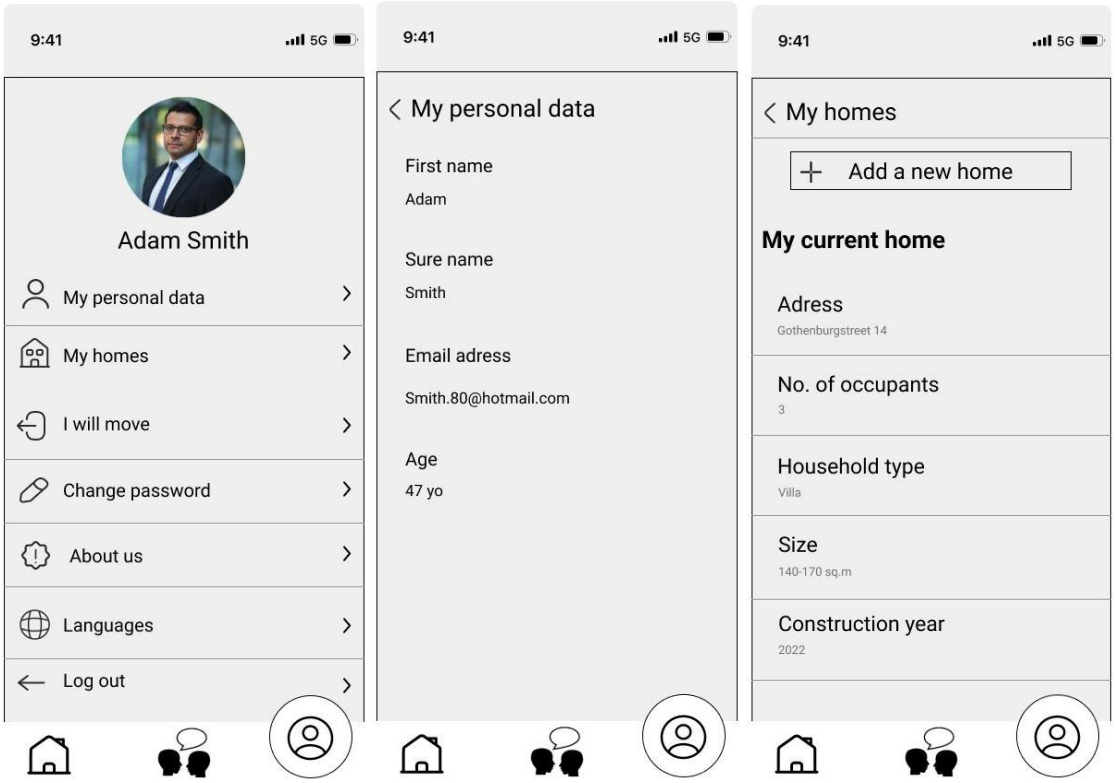


Figure 16 Profile screens

4.9 Product prototype functionality

The "Ellow" application High fidelity design is complete. It enables users to control their electricity usage through a tab bar with three primary functions. The first function is the home icon, which displays the power usage for today in kWh and provides a scroll menu of rooms in the home and the number of devices in each room. This feature allows users to control each device in the room by toggling a switch.

The home page also features an overlay pop-up menu that provides a convenient way to control all active devices individually or collectively. A notification button is also available, which shows the history of all notifications sent. These notifications can include reminders to turn off devices that were left on, information about electrical statistical data, and messages from specialists or other users. See Figure 17.

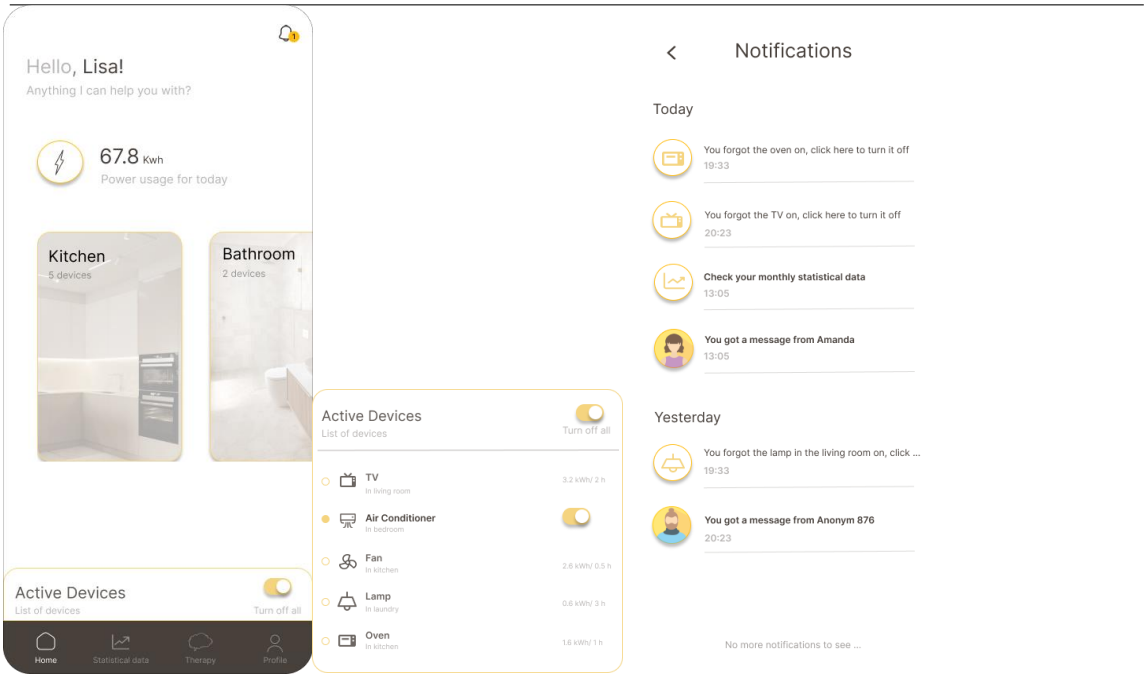


Figure 17 High-fidelity prototype of home page and notification feature.

When clicking on a room from the home screen the users can add a new device to the desired room by scanning and naming the product. After that the device will be added to the specific chosen list. The electricity application has a feature that allows users to remotely control the devices. To make this feature inclusive and suitable for a wide range of users, including the average consumers, it decided to include both the "turn on" and "turn off" functions. While having only the "turn off" function would be beneficial for individuals with OCD, incorporating the "turn on" function ensures that the application can be used by everyone, regardless of their specific needs or preferences. See figure 18.

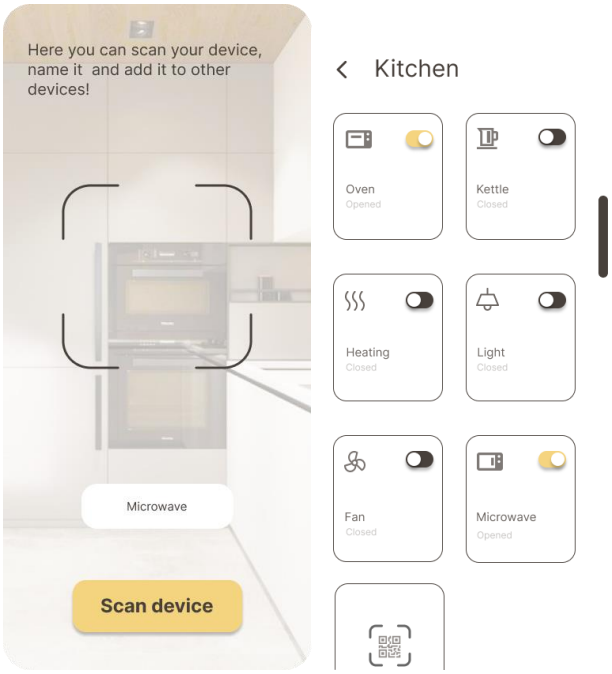


Figure 18 Scanning feature and the ability of switching devices on and off.

On the apps tab bar, the is a function called statistical data that displays all the energy consumption records based on time periods such as day, month, or year. Users can use this feature to monitor their usage pattern and identify areas where they are wasting more electricity than needed. The cherry on top is that you can view power consumption records of your top five energy hogging appliances by dragging a yellow point on the graph and seeing it in kilowatt hours (kWh).

Additionally, a circle diagram shows what appliances contributed to most consumption during every specific period. It is convenient to know which appliances are gulping excessive electricity so you can work towards decreasing the bills. The utilization of statistical data features is a crucial tool for individuals to track their energy usage and make well informed choices regarding it. See Figure 19.

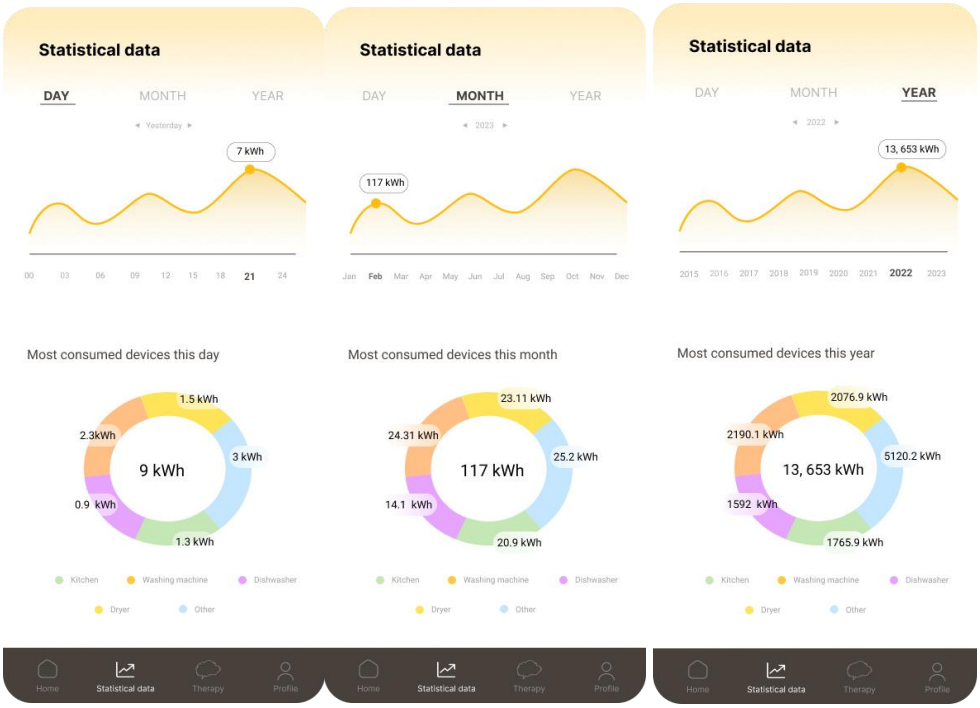


Figure 19 illustration the high-fidelity prototype of statistical data shows in day, month and year.

For people dealing with obsessive compulsive disorder (OCD) accessing therapeutic support is possible through this mobile app. Designed specifically for those with OCD symptoms the app offers patients seeking help avenues towards breaking down barriers that may have hindered earlier attempts at treatment. At its essence is an anonymous community building feature that connects users together; here they commiserate over shared experiences.

Through these conversations participants gain strength knowing they are not alone in contending with the various challenges brought on by dealing with OCD. If user needs evolve beyond community assistance or connecting anonymously, professionals specializing in providing evidence-based treatments. During consultations, certified therapists provide accurate diagnoses regarding underlying symptoms. While, crafting targeted therapy plans specific for individual patient needs. They also extend ongoing

guidance/support through patients' journeys towards recovery from OCD while ensuring quality of life remains a priority throughout the process.

Individuals facing the challenges of OCD have an additional form of assistance available via this mobile apps therapy function. This feature enables anonymous connections between users allowing them a means of support by conversing with others who may understand their feelings of isolation. Moreover, specialist assistance is also accessible via the app if needed which is vital since accurate diagnosis plays a critical role in treating OCD appropriately.

Skilled experts can diagnose conditions accurately and offer evidence-based treatments that cater specifically according to every individual's unique needs; these treatments help manage symptoms while enhancing quality of life. Additionally, professionals equipped in treating OCD can provide much needed guidance on tackling everyday challenges associated with living through this condition, from teaching practical coping skills that aid managing symptoms effectively towards general wellbeing improvement. As such the therapy function found within this mobile application provides an alternative means for individuals with OCD to reach out for professional assistance while also connecting with others facing similar experiences. See Figure 20.

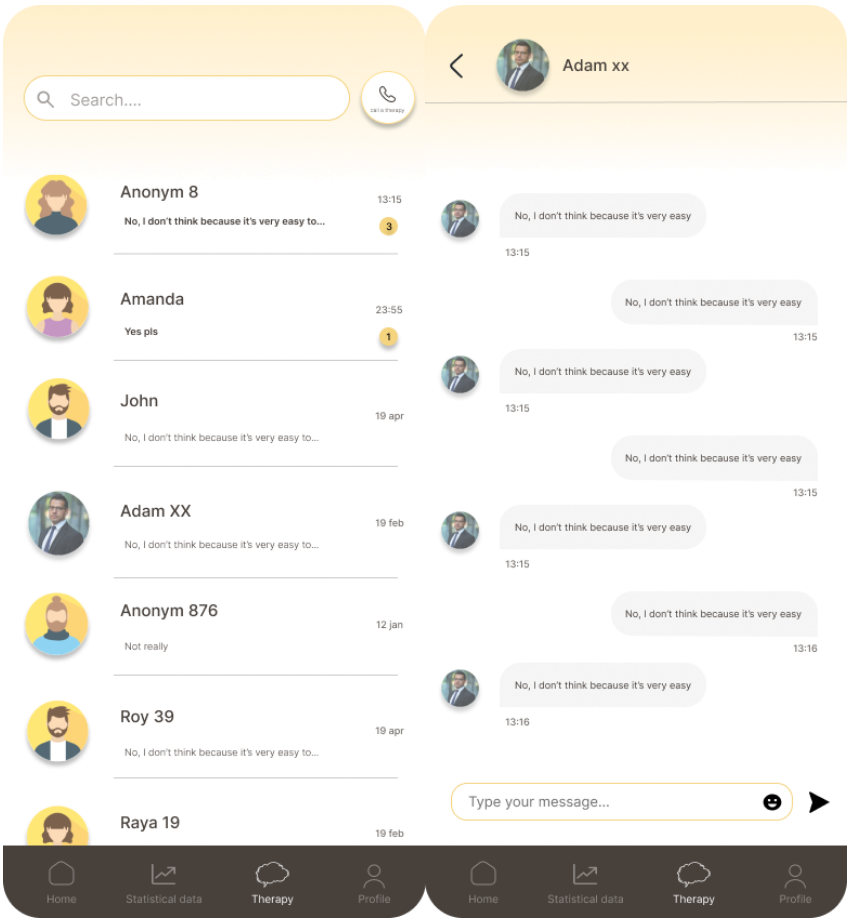


Figure 20 illustrates the high-fidelity prototype of therapy page.

One of the primary features of the mobile application is the ability for users to anonymously select from a numerous therapists and psychologists. Additionally, the application allows users to call their selected mental health professional directly through the app. See Figure 21.

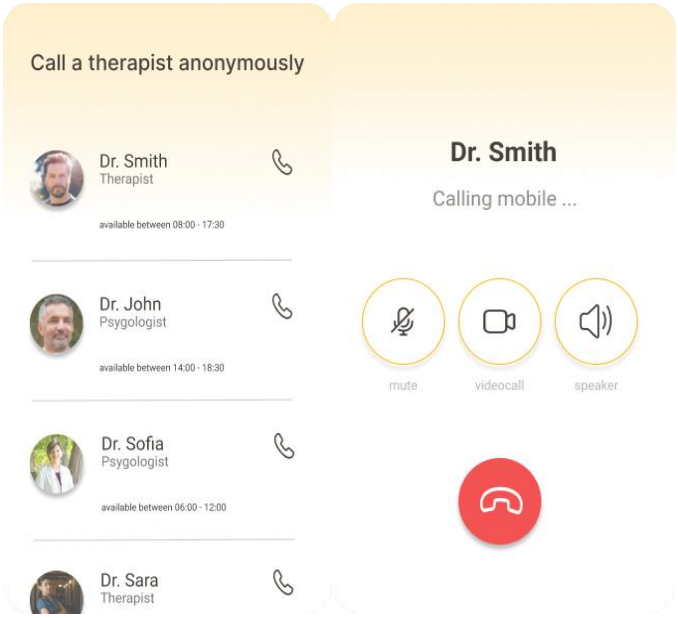


Figure 21 illustrates the high-fidelity prototype of calling a therapist-feature.

The fourth tab in this mobile app belongs to the profile. Once clicked on, it leads to two distinct sections, Personal Data and More Settings, each with their own sub-sections. Of these two personal data comprises My Account, with username and email and My Homes, housing related details. Whereas the second section, More Settings, possesses three separate sub-sections within Language selection, offering several choices, About details along with Log Out.

An insightful overview of its purpose and features is provided within the "About" subsection for more user understanding of the application. Furthermore, guaranteed data privacy and security is ensured through the inclusion of a "Log Out" button in this section. See Figure 22.

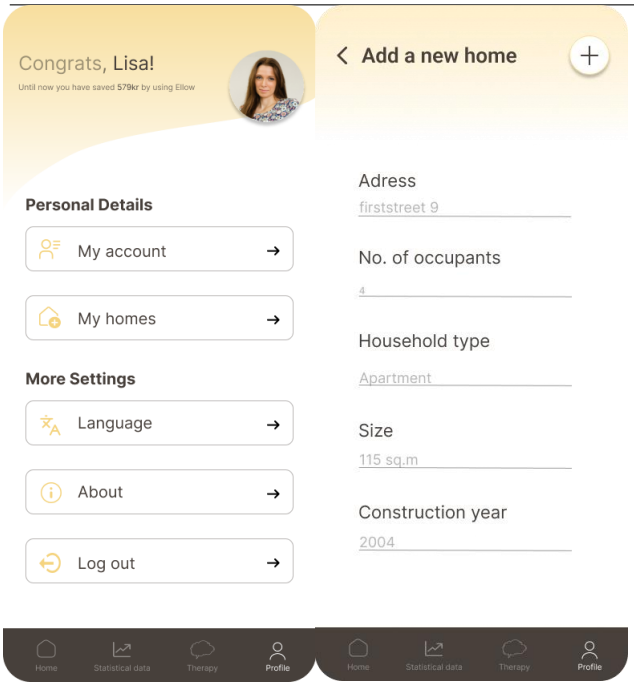


Figure 22 illustrates the high-fidelity prototype of the profile page.

Users can add a new residence to the application by selecting the "+" button, which entails providing details such as the address, number of occupants, household type, size, and construction year. Furthermore, users have the option to switch between various languages seamlessly by selecting the language button, resulting in a comprehensive language transformation across the entire application. See Figure 23.

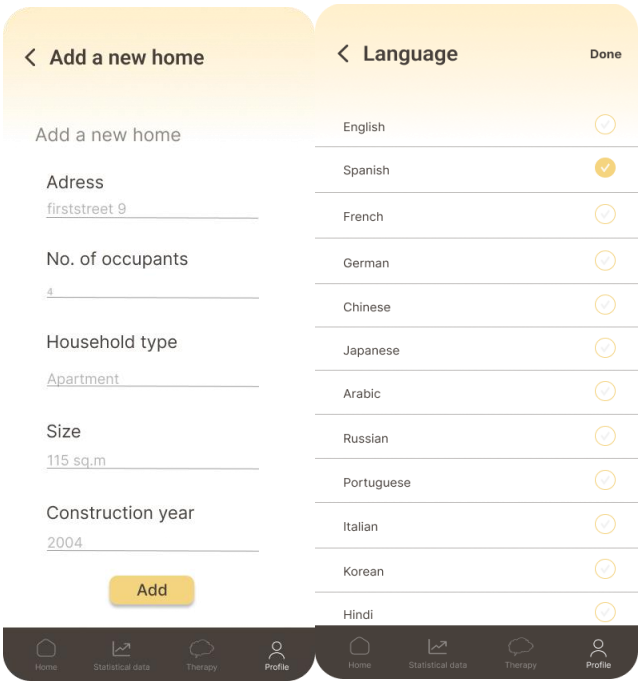


Figure 23 illustrates the high-fidelity prototype of adding a new home and changing the language.

5
Results

This section is about the different results from the surveys, interviews, and the final prototype.

5.1 Survey and interviews results

This part discusses the different surveys' results and the interviews.

5.1.1 Low fidelity

In our project, we created a simple model using a combination of design and tools, like pen and paper. 15 people took part in the survey test to gather feedback. To enhance the evaluation of this prototype, we conducted surveys that included open- and close-ended questions and the Likert scale. This allowed us to collect all types of feedback from the participants in this experiment. Overall, most participants expressed enthusiasm about using the electricity-monitoring app, as shown in Figure 25. Furthermore, Figure 26 highlights how installing the app made our participants feel safer when managing their electricity usage.
For the survey results, see Appendix A.II.

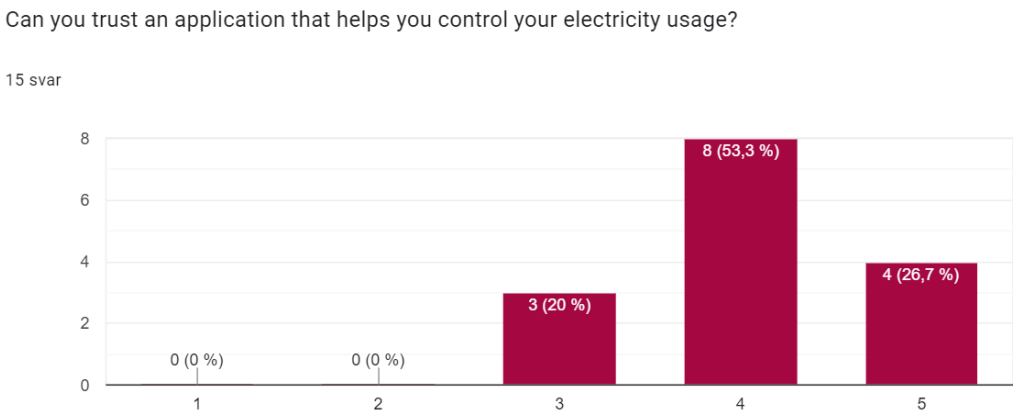


Figure 24 illustrates a diagram that shows different results, where 1 is not at all and 5 is for sure.

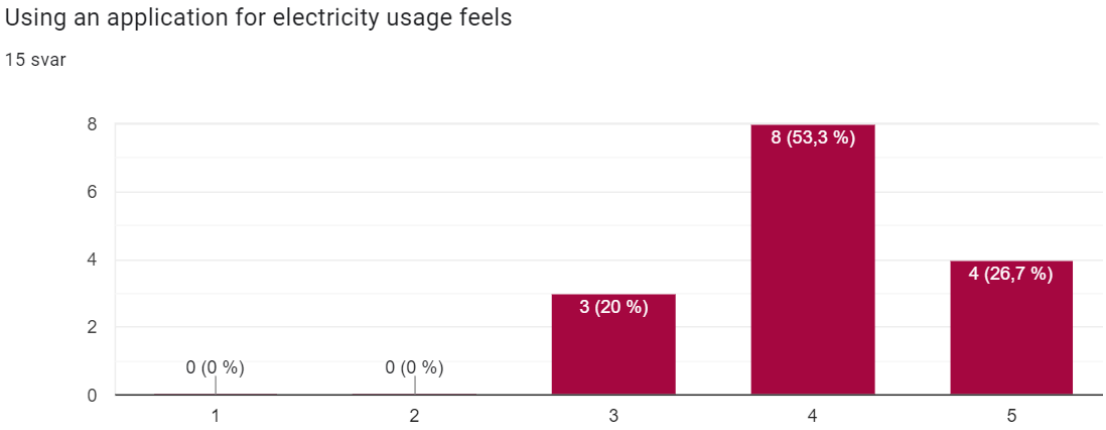


Figure 25 illustrates a diagram that shows different results, where 1 is unsafe and 5 is safe.

5.1.2 High fidelity

This section is about the high-fidelity survey and interviews.

5.1.2.1 High fidelity survey

The high-fidelity prototype went through a combination of surveys and interviews. The survey phase involved asking for personal information from participants, followed by providing them with a link to the Figma prototype. The number of participants involved in the tests amounted to 25. Participants were then asked to complete several tasks and provide their feedback, including any suggestions for improving the application.

Responses varied and included constructive criticism, which could aid in the development of the application and its underlying concept, as well as neutral comments. The design of the mobile application was impactful on the tester's due to its easy-to-use and simplified design and calming colors. One tester had this to say, “I like how simple and efficient the prototype is. I like the colors and the styling of the design element”. Another quote of a tester was, “It is especially useful to check the monthly consumption. Next month you want to consume less energy! It´s like a competition :)”. These two comments, and some similar comments indicate that the application is intuitive, and has a good flow. This garnered recognition and acclaim for its universally accessible and user-friendly layout, which facilitated ease of navigation and utilization for the users. See Figure 26. For the survey results see Appendix A.III.

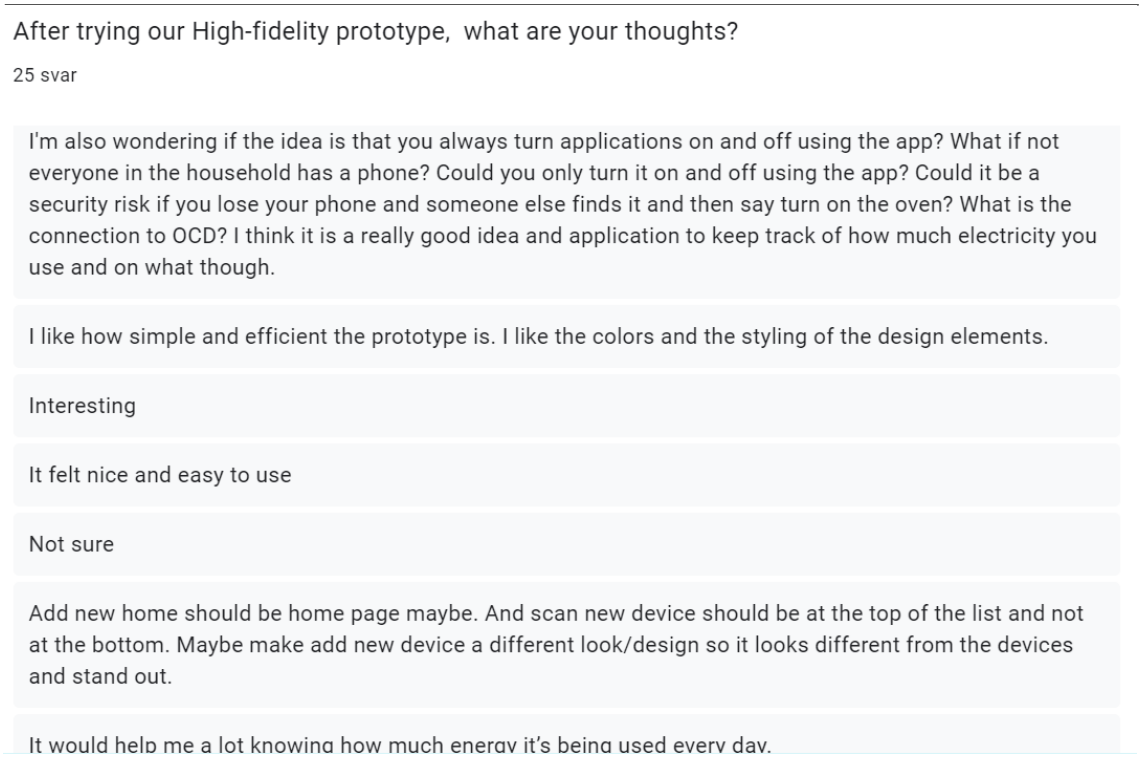


Figure 26 Answers from one question in the high-fidelity prototype.

5.1.2.2 Interviews

Our interviews took place through Zoom, and we have produced three charts indicating certain queries asked throughout the interview process. These diagrams aid in examining the information obtained from these discussions.

Upon interviewing, we uncovered that all participants were within the age range of 23-29 years old with two of them still studying while one worked as a preschool instructor. None of them disclosed any religious affiliations or expressed an interest in discussing beliefs when prompted. Additionally, when questioning housing situations, it was concluded that 66% of interviewees lived within apartments while 33% lived within villas.

During the interview, a specific question was posed to assess the potential of an electricity application in reducing stress and anxiety among users. This question assessed the viability and suitability of the project idea for a particular user group. See Figure 27.

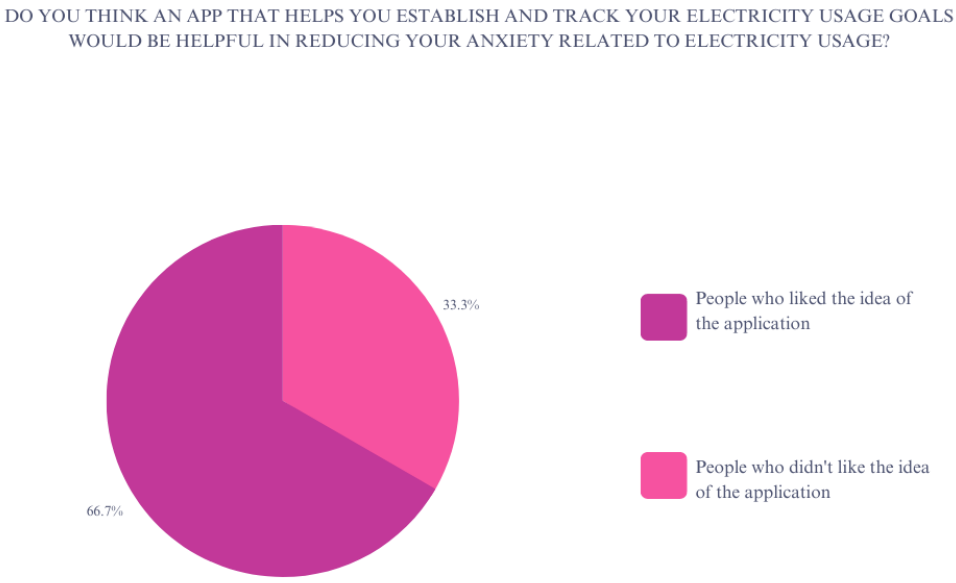


Figure 27 demonstrates a Pie chart showing a percentage answer from the interviews.

To explore the usage of electricity in controlling devices and appliances, an important question was asked regarding the users' comfort level with technology for monitoring their electricity consumption. This question aimed to assess how at ease the users feel when it comes to using technological solutions to track and manage their energy usage. By understanding their comfort level, we can better understand if implementing electricity monitoring technologies would be feasible and well-received by the users in their daily lives. See the results in Figure 28.

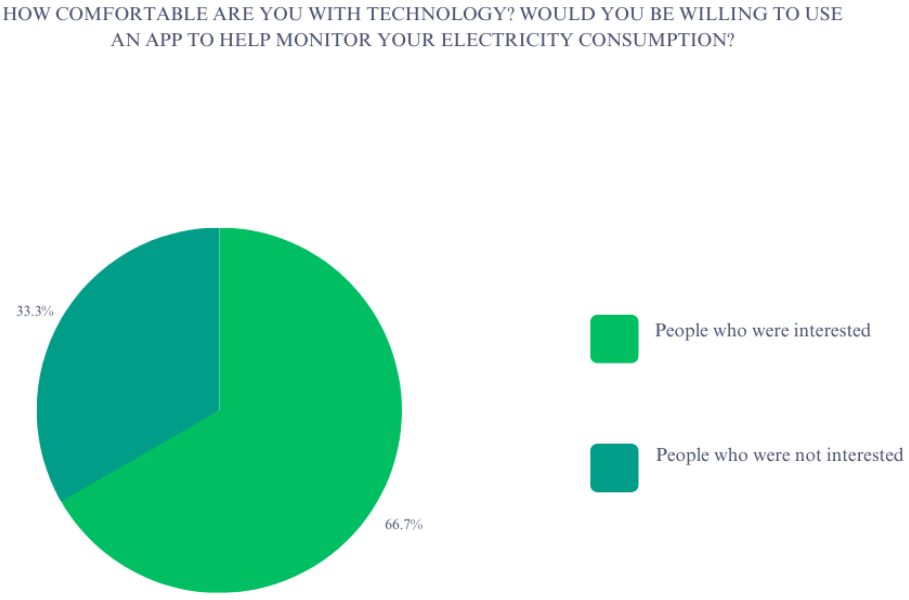


Figure 28 Pie chart showing a percentage answer from the interviews.

To evaluate the feasibility of an electricity monitoring application, a question was posed to understand the extent to which individuals and users are actively seeking to reduce their electricity consumption and the strategies they employ to do so. This question aimed to gather insights into people's motivations and behaviors regarding energy conservation. By gaining a better understanding of their intentions and approaches towards reducing electricity usage, we can assess the potential value and relevance of developing an electricity monitoring application to support their energy saving efforts. See Figure 29.

For more details about the interviews, see Appendix B.

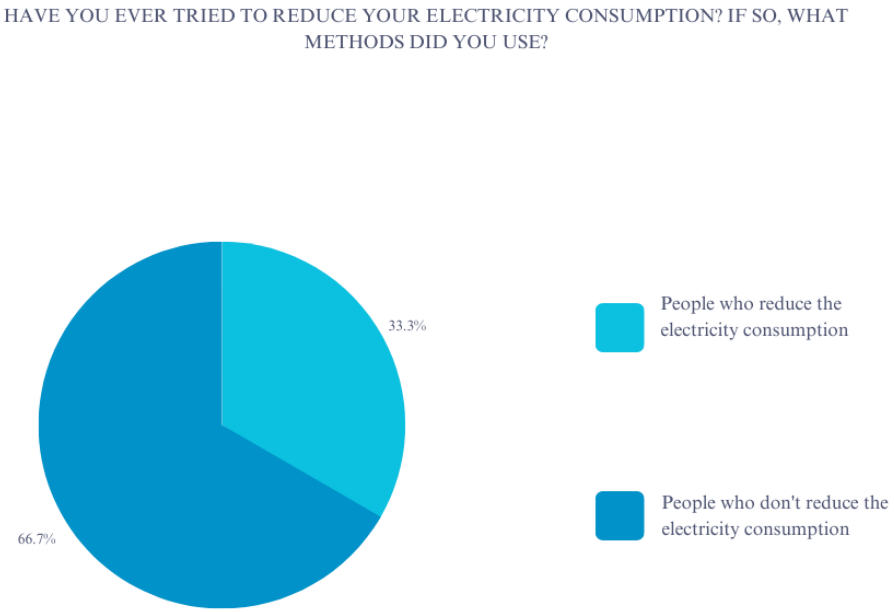


Figure 29 Pie chart showing a percentage answer from the interviews.

6
Discussion

This section discusses the testers, interviews, and research questions.

6.1 Testers

In this section each conducted test will be analyzed and discussed.

6.1.1 Surveys

The survey of designing an electricity consumption application for people with OCD comprises two components, one for the low fidelity prototype and the second one for the high-fidelity prototype. Despite using different prototypes, both surveys included identical questions. This is because the surveys were shared on several platforms, such as social media platforms like Facebook groups specific for people with OCD, LinkedIn, and the Swedish OCD association. This also provided a way to compare the results between the tests and note the differences.

Each survey has four sections: the first is about confirming the survey's participation and that users accept the use of their information for the study, i.e., GDPR concerns. The second section is to know who our users are focusing on their age, occupation, gender, how do the user live, what type of housing do the user have if the user is using technology in every day's life, what type of technology do the user use, and religion.

The third part of the survey focuses on understanding how people with OCD use electricity. We wanted to learn about their habits and preferences so that we could design an application specifically for them. In this section, participants are asked to rate how often they engage in certain activities related to electricity usage. For example, they are asked how often they turn off lights when leaving a room, if they feel the need to repeatedly check appliances before leaving home, and if they have intentionally reduced their appliance usage at any time.

This part of the survey explores how people's mental well-being influences their energy usage habits. The questions ask if users feel uneasy or anxious when they can't control their home's electricity usage effectively. It also investigates whether they are open to using an application that monitors energy usage. This section is important because it helped us understand the specific needs of individuals with OCD when it comes to their electricity usage patterns. By learning about their daily routines and experiences, we can create a personalized app that meets their needs and preferences.

In the fourth phase of the survey, we focused on various levels of prototype fidelity. For low-level fidelity prototypes, participants were asked to identify important app features and evaluate the clarity of the interface design. The feedback received would also assess how well the app's usefulness translates into real-life usage. For high-level fidelity prototypes, participants tested the app's functionality and provided feedback on their overall experience, including any potential challenges they encounter in understanding the app's design.

The importance of these tasks cannot be overstated as they provide invaluable insights into how users perceive our prototype. Surveys are a useful tool in capturing opinions, behaviors, and preferences which inform design decisions aimed at making the final application more effective and user friendly.

Designing a successful product requires careful evaluation every step of the way. One way to do this is by utilizing multiple surveys that focus on different prototype fidelities. Through analysis of these surveys the design team gains valuable insight into what users want and need from their application resulting in higher satisfaction rates overall.

6.1.1.1 Low fidelity prototype survey

The fourth section of our initial survey involves testing a low fidelity prototype for our upcoming mobile application. The Figma link that was provided allowed respondents to try out some of its primary features in an early-stage state. Participants were assigned various tasks, such as turning off their cooker hood, checking electricity prices for the day, listening to meditation recordings, or updating home statuses. These tasks aim to help participants become familiar with how they can interact with the application and understand its functionalities better. After these tasks have been completed, the follow up questions gather feedback related to their experiences of the tasks:

- Did they complete the task they were set to with ease?
- What were their overall thoughts interacting with something still so rudimentary?
- Is there anything they had suggest we tweak or update moving forward?

Another question posed was if any participant would be interested in testing the high-fidelity version as well. Additionally, if there are any remaining questions or concerns after trying out the prototype, we encourage participants to share them. This phase is crucial for us as we strive to enhance our mobile application. For more details, please refer to Appendix A.I.

For more details about the low-fidelity survey answers, see Appendix A.II.

6.1.1.2 High fidelity prototype survey

The fourth section in our second survey was vital to testing usability as it assesses user interaction with our high-fidelity prototype. The Figma prototype was made accessible through a provided link within the survey form for user convenience. To fully evaluate functionality and ease of use carefully selected tasks are required.

1. Add a new device to the kitchen.
2. Check the statistical data for August 2013.
3. Call Dr Smith.
4. Add a new home to your homes.

We chose these tasks because they cover a wide range of functionalities and engage users in diverse ways. To accommodate participants' preferences, we have included a "skip" option for anyone who does not want to participate in a specific task. Our goal is to create a comfortable environment where respondents can freely share their feedback and opinions without feeling pressured to complete tasks they do not want to do. After completing the tasks, we asked users several questions about their overall experience using our application. Here are some examples:

1. Which tasks did you perform?
2. How easy or difficult was it to complete the tasks?
3. Did you encounter any issues while performing the tasks? If so, please describe.
4. What did you like about the application?
5. What could be improved in the application?
6. Are you interested in participating in further testing of the application?
7. Do you have any other comments or suggestions?

Feedback was critical in making our application better and more user-friendly. By analyzing responses from a low fidelity prototype, survey changes were made to enhance towards a high-fidelity version. One such change involved transforming Therapy from its initial social media platform design to an anonymous yet engaging conversational platform designed to reduce anxiety while improving communication efficacy. See Figure 30.

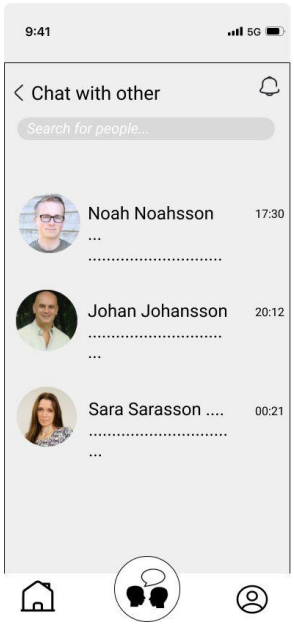


Figure 30 shows the chat function in the digital low-fidelity prototype.

It is important to acknowledge that the survey results may be influenced by the open format approach. This means that participants without OCD provide feedback, and there is a possibility of individuals answering the survey multiple times, which could lead to inaccurate outcomes. To mitigate this potential bias, we included a qualitative data collection section at the end of the survey. Furthermore, we categorized the responses into two groups: those who provided constructive criticism or positive reactions, and those who did not provide any feedback on our prototype. Both groups played a crucial role in providing valuable insights and improving the prototype. For more details see Appendix A.III.

6.1.2 Interviews

During our research on an electricity app idea, we conducted interviews and found that recruiting participants through low-fidelity prototypes proved most effective for subsequent high-fidelity testing. The prototype included a question asking if they would like to take part in our Zoom high-fidelity test while providing their email address for contact purposes. This recruitment method enabled us to enlist three volunteers for high-fidelity testing.

We faced challenges in scheduling participation from professionals at the Swedish OCD Association, which would have provided valuable perspectives on the impact of managing electricity usage for individuals with OCD. However, we were able to gather valuable feedback through interviews and engaging conversations with prospective volunteers, with each session lasting around 20-25 minutes. The interview process involved asking questions about personal information and current practices related to managing household electricity usage. A key focus of these questions was to explore the connection between

effective energy management and mental well-being. Participants shared insights on their perceived control over energy use and any associated anxieties that may arise from feeling a lack of control.

Furthermore, participants shared information about their routines for monitoring energy consumption and the strategies they use to turn off appliances when not in use. These insights played a crucial role in understanding effective energy management practices. Additionally, we gathered opinions about the potential advantages and disadvantages of using an electricity management app.

After completing the interviews, all participants were presented with a link to the prototype version of an app created specifically for managing OCD symptoms. They were tasked with performing a series of tests aimed at replicating real-life scenarios and assessing the level of usability that the device offered.

Additionally, the feedback they provided on the app, its design, features, and improvement ideas were all collected. Symptom severity of OCD varies from person to person, which determines individual's attitudes and thoughts on potential solutions such as using an app to manage OCD symptoms. In this, we explored two different responses from participants with OCD, in response to the question of whether an application that balances ease of use, useful features and minimal stress would be the most effective. The first participant replied in affirmative saying "I think an application that balances ease of use with useful features and minimal stress would be most effective." The participant acknowledges the importance of creating a user-friendly and useful application. They highlighted the need to reduce anxiety for individuals with OCD when using the app.

Based on their response, the individual has a positive outlook towards using apps as a form of treatment for OCD. It was also noted that not all app-based solutions are suitable for everyone with OCD symptoms. However, the interviews provided valuable insights into the current electricity management strategies employed by individuals with OCD and highlighted the potential benefits of developing an app tailored to their specific needs. One participant said that an app focusing on establishing and tracking electricity usage goals could help reduce anxiety related to electricity consumption.

By incorporating participants' suggestions gathered through both interview and prototype testing phases, into its final configuration we aim to deliver an incredibly useful tool with improved usability.

For more details about the interviews, see Appendix B.

6.1.2.1 Challenges

Finding suitable participants for research studies, particularly individuals with OCD, is crucial for the success of the research. To address this, we reached out to the Swedish OCD Association, a prominent organization supporting people with OCD in Gothenburg. Our main objectives were to interview potential participants, gain insights into their symptoms and behaviors, understand their coping strategies, and test a prototype of our application.

Unfortunately, some individuals were hesitant to participate or provide feedback. People with OCD often have reservations about new interventions that challenge their existing coping mechanisms. We recognize that introducing something new into their lives can evoke anxiety and uncertainty. As researchers committed to making a positive impact through technology-based solutions, it is important for us to understand and address these concerns.

We had an email that included feedback from some patients in the Swedish OCD Association. We expanded our outreach efforts to include platforms like Facebook groups and LinkedIn to find participants who were willing to provide valuable feedback. This allowed us to gather diverse perspectives on the potential usefulness of the app prototype, while respecting the rights and preferences of each participant and adhering to ethical research practices. The comments received were as follows:

"*Det blir en app som bara matar det kontrollbehov och tvång som man redan har genom att ständigt koppla upp sig till de.. Kommer ju inte åt grundproblemet direkt.*

Det verkar vara en app som ska fungera som "försäkring" om att man har stängt av elektriska apparater och det går inte i linje med det som vi och professionen står för - att man ska stå emot tvånget utan försäkringar.

Detta är ju försäkring. Just sådant man gör allt för att arbeta mot i terapin. På behandling mot OCD, direkt avrådan enligt mig.

Låter tyvärr inte genomtänkt… Man vill vara "snäll" och hjälpa men gör personen en björntjänst i livet. Detta bör vi inte ställa upp på. De får hitta på någonting mer konstruktivt.

Säkerligen en bra idé från tjejerna men appen kanske också kan innebära mer stress."

The translation of the comments are as follows:

- It will be an app that only feeds the need for control and compulsion that one already has by constantly connecting to them. It does not address the underlying problem directly.
- It is an app that functions as an "insurance" that one has turned off electrical appliances, which is not in line with what we and the profession stand for, that one should resist compulsions without such assurances. This is an assurance, precisely what one works against in therapy. For treatment of OCD, I strongly advise against it.
- Unfortunately, it does not seem well thought out... One wants to be "kind" and help but is doing the person a disservice in life. We should not support this. They need to produce something more constructive.
- Undoubtedly, it is a clever idea for the girls, but the app may also cause more stress.

Some reasons for the negative comments that we got can be that people who have OCD do not like specialized applications, Ellow is one of them, and this application could help them but also trigger their compulsive control by providing a platform to obsessively

monitor their energy use (RISE, 2023). Another reason can be that they felt discriminated against, as OCD people need extra help with electricity, and this can be stressful for people who are led by of their OCD symptoms, Pandzic et al.(2019).

In a later stage of the project, we attemped to reach out to the head of the Swedish OCD association to gain their support. Our aim was to expand our outreach and engage with a wider audience. The association's team was supportive and expressed a willingness to collaborate with us. As part of their support, they agreed to publish posts about our project on their social media platforms such as Facebook and Instagram. See Figure 31.

However, we faced a challenge as the publishing date for the posts were delayed due to the need for approval from everyone on the board. Unfortunately, this delay negatively impacted our project as we could not benefit from the intended outreach and promotion.

One response that we received via email was from a psychologist associated with the Swedish OCD Association, who shared similar concerns with other individuals diagnosed with OCD and expressed a negative reaction to the app idea. When we inquired about the reasons behind the psychologist's perspective, the response was: "Allt en person gör för att skaffa kontroll gör deras hjärnor känsligare och mer tvångiga liksom. All behandling går ut på att släppa kontrollen," which translates to: "Everything a person does to gain control makes their brains more sensitive and compulsive. All treatment is about letting go of control."

This perspective reflects the fundamental approach to treating OCD, which involves reducing compulsive behaviors and intrusive thoughts through a process of acceptance and mindfulness, rather than attempting to control or eliminate them. The psychologist's perspective indicates that creating an app tailored for individuals with OCD to track their electricity usage might strengthen their desire for control and worsen their compulsive behaviors, rather than assisting them in managing their symptoms. Instead, effective treatment for OCD typically involves addressing underlying psychological and emotional factors that contribute to compulsive behavior and developing strategies to reduce anxiety and promote acceptance of uncertainty.

Figure 31 illustrates The Swedish OCD association published a post on their social media.

6.1.3 RISE

The Research Institutes of Sweden (RISE) provided significant input on a high-fidelity prototype through several Zoom meetings with two to three experts at once. This section discusses how this feedback impacted this prototyping process' development stages.

These informative discussions focused on its design, functionality, and other potential improvements presented by RISE experts. They encouraged designers to think beyond specific constraints while considering various perspectives in an interdisciplinary manner effectively yielding well-rounded results.

RISE asked questions to understand the purpose of users' prototypes and gather feedback to improve the overall experience. The goal was to better understand the needs of different audiences or industries and ensure that the prototype meets their specific requirements. This thorough exploration is important before working on complex projects like building technology platforms. Each part of the feedback recorded was carefully documented. We sought ways to refine and improve the prototype based on feedback from RISE expertise. This feedback allowed us to gain comprehensive perspectives and identify areas that were previously overlooked.

We prioritized receiving feedback from field experts to improve their prototype's quality. This method allowed us to enhance its usability and cater it precisely toward its target audience's needs. Their meticulous attention resulted in a refined product with exceptional user experience quality that fulfilled all requirements for which it was designed.

6.1.4 Answering the research questions

6.1.4.1 Research Question 1

What should be considered when designing a device which controls and reads electricity consumption of electric dependent technology?

Accuracy

When creating devices for controlling and monitoring electrical consumption, it is important to consider numerous factors for success. One crucial factor is ensuring accuracy, enabling consumers to make informed decisions about their energy usage. Our application incorporates tools and techniques to make monitoring electrical consumption effortless. Real-time information about electricity usage is displayed through a statistical data icon on our tab bar, see Figure 19 . We present daily costs in a graph format with a yellow dotted line that users can drag to any desired day, providing detailed information about their power usage. Hovering over the graph points reveals information for any given day. Additionally, our circle graph highlights the top five devices consuming the most electricity, helping users identify areas where they can effectively reduce energy consumption.

In conclusion, accuracy is vital in the development of devices aimed at controlling and monitoring electrical consumption to promote sustainable practices and efficient use of resources. Making informed choices about energy usage is crucial for effective resource management. Accurate readings enable us to identify areas where we can reduce consumption, save money, and promote an eco-friendly lifestyle that benefits both present and future generations.

Simplicity

Simplicity is the key when designing systems to track and control energy consumption rates. User ease of use should be considered from the beginning of the development process. Providing a simple interface with easy-to-use commands for all users, regardless of technical ability, contributes to an exemplary user experience. This is particularly important when dealing with complex tasks such as tracking energy consumption rates. Visual cues like colors enhance the user experience and improve navigation efficiency, benefiting individuals with different cognitive abilities.

An effective electricity consumption control system should prioritize user experience in interface design. Switches access for quick adjustments in power usage without complications was essential for a positive experience. Simple features like allowing users to easily turn off specific devices through a single app click enable the creation of useful tools that integrate well with daily routines.

Security

Designing any device that handles sensitive user information must prioritize security. This involves incorporating encryption at both hardware and software levels, implementing firewalls against external intrusions, and secure authentication mechanisms for authorized

access only. Regular updates are crucial to maintain high-security standards, and additional measures like password managers help mitigate potential breaches in case of device loss or theft. The user data is securely stored within the system, enhancing overall security.

Compliance with data privacy laws is another critical aspect that should not be overlooked. Especially in industries such as healthcare or finance, where sensitive information may be involved, prioritizing data privacy and security is of utmost importance. Adhering to local certifications and accessibility requirements ensures that the device meets the necessary standards and regulations.

Affordability

When designing a device that controls and reads electricity consumption of electric-dependent technology, affordability becomes a crucial aspect to consider. Ensuring that the product is priced in a way that makes it accessible to a wide range of users is important for its success. One strategy to achieve this is by offering the app for free, which allows for alternative revenue generation through advertisements or in-app transactions that unlock additional functionality or premium services.

Accessibility and Usability

Designing an application that globally tracks electricity consumption for OCD sufferers requires prioritizing user accessibility and ensuring that the device is user-friendly for individuals worldwide. This can involve incorporating multilingual support, allowing users to interact with the device in their preferred language. Cultural considerations play a significant role in the design process. It is crucial to understand and respect cultural conventions, social expectations, and norms specific to each region. By doing so, the device can avoid unintentionally offensive content, cultural taboos, or language that may hinder its acceptance and adoption.

In summary, the text above discusses essential considerations for designing systems aimed at tracking and controlling electrical consumption. It underscores the significance of accuracy, simplicity, security, affordability, accessibility, and usability in developing effective energy management solutions. Here's a bullet list summary of the key points:

- Accuracy:
    - Emphasizes the importance of accuracy in devices for monitoring electrical consumption.
    - Describes features like real-time information, daily cost graphs, and device consumption ranking.
    - It stresses that accuracy enables informed choices, resource management, cost savings, and eco-friendly living.

- Simplicity:
    - Highlights simplicity as a key factor in designing energy consumption systems. Advocates for user ease of use from the project's inception.
    - Recommends a simple interface, visual cues, and quick access to power adjustments for an excellent user experience.

- Security:
    - Emphasizes security measures for devices handling sensitive data.
    - Lists encryption, firewalls, secure authentication, regular updates, and password managers. Highlights data privacy compliance and adherence to industry standards.

- Affordability:
    - Discusses the importance of pricing devices for wide accessibility.
    - Suggests offering the app for free with alternative revenue generation methods like ads or in-app transactions.

- Accessibility and Usability:
    - Prioritizes global accessibility and user-friendliness.
    - Recommends multilingual support and cultural considerations. Underlines the significance of understanding and respecting regional norms to avoid potential issues in adoption.

6.1.4.2 Research Question 2

What are the implications of designing an energy controlling device for the elderly and people with OCD?

Privacy concerns

Designing an energy controlling device for individuals necessitates giving attention to potential privacy concerns, particularly when catering towards elderly people or individuals who have OCD disorder. While these devices are useful in gathering behavioral patterns, energy consumption trends, and other personal data, not all users may find sharing this information safe or trustworthy. Users suffering from OCD may have specific apprehensions about their confidential data, leading to a lack of trust in smart home technologies' functionality altogether (RISE, 2023).

This could result in users being hesitant to share their information thereby lowering its effectiveness. To tackle this challenge, designers must integrate robust security features like encryption and password protection into the design of the devices. This ensures the confidentiality and safety of sensitive user data. Further clarity on data usage policies can also increase customers' faith and confidence in adopting such innovative technologies for daily use. Compliance with privacy laws and regulations is also essential to address potential privacy concerns. The device should adhere to relevant privacy regulations and inform users of their rights regarding data usage and storage. Furthermore, user data should be anonymized where possible to protect individual privacy.

Incorporating measures to address privacy concerns while creating an energy control device can help increase user trust. Such enhanced confidence can result in widespread use of the technology resulting in greener energy consumption habits. Thus, emphasizing user data protection is imperative to guarantee that this gadget serves its purpose

effectively while also having a positive impact on both our planet's health as well as people's lives.

Technical challenges

It is not always easy designing an energy controlling device that will work well for a broad range of users, whether they are elderly folks or people with OCD who might have unique needs. There are some technical challenges involved in making this kind of product but if you take a comprehensive approach you can succeed.

One key challenge is creating an interface that is easy for anyone to understand, no matter how tech savvy they are or not. The user will need to make sure that the device is customizable enough so people can really tailor it according to their own preferences, after all different people have different priorities when it comes to saving energy. To achieve this level of user friendliness and customization extensive testing and research is required. By identifying what kinds of features users need most, and which they find most frustrating, an effective energy control device that meets everyone’s needs can be designed.

Designing an energy controlling device that is accessible to many users is an intricate process filled with technical challenges such as ensuring compatibility with different appliances, lighting fixtures, heating, or cooling systems, all intended for streamlined energy monitoring alongside precise power management capabilities. Overcoming these challenges calls for sophisticated engineering techniques dedicated to creating a device that interacts seamlessly across multiple technologies integrated into one comprehensive system. Technical difficulties posed by unsuitable design features or malfunctions could disrupt the user experience leading to dissatisfaction or failure of adoption rates.

Thus, ensuring that extensive testing methods covering various scenarios are implemented correctly are necessary for quality assurance purposes before launching the device free from any glitches or faults. Finally, devising a user-friendly energy controlling device demands an exhaustive design approach focusing on intensive user research aimed at improving satisfaction levels while assuring ease of use across several users' demographics commonly faced daily challenges related to energy consumption behavior patterns.

Affordability

Affordability is key when it comes to designing energy controlling devices for elderly and low-income users if we hope for them to make as much of an impact as possible. It is crucial that these tools can be accessed by people across multiple income levels if we hope they will gain widespread acceptance and usage rates.

While this is certainly desirable, cost issues remain problematic for those without financial means since most cannot afford them on their own. This is an unfortunate roadblock preventing more comprehensive usage rates among these groups while limiting overall efficacy levels at large. If we can solve this affordability issue through alternative means

however, we could potentially advance these adoption rates and make the devices even more effective.

The cost of energy controlling devices has been identified as a challenge affecting senior citizens and low-income earners. To make the device accessible to them it may be necessary to seek various solutions including funding or subsidies from governments or nonprofit organizations. This initiative can go a long way in reducing the expenses required for purchase while still maintaining the quality and functionality that users desire.

Alternatives like lowering manufacturing costs by adopting cost-efficient methods such as design simplification and using cheaper materials are also viable solutions. Ultimately implementing these measures could significantly increase accessibility of energy controlling devices, lowering economic barriers for seniors and people with limited resources.

Accessibility and Usability

In designing an energy control gadget for the elderly and individuals with OCD tendencies, it is crucial to factor in their distinct requirements and proclivities. Even though there is an attempt to make a comfortable and user-friendly gadget accessible, some users' limitations may not be catered for by this gadget.

As an instance observation of certain features of the tool, it can be discomforting or overwhelming due to sensory processing issues common among individuals with OCD tendencies; sounds colors and other sensory inputs designed for providing feedbacks could pose a challenge for them. Furthermore, the elderly might require larger buttons on the gadget because of their visual impairment conditions. Recognizing that different users have unique needs makes it impossible always to design a product accommodating everyone's preferences entirely; hence designers should aim at developing inclusive tools as much as possible through gathering information regarding individual's needs via user testing.

Designing an energy controlling device requires considering numerous factors such as accessibility and usability, especially for elderly individuals or those with OCD tendencies. It is essential in creating a product capable of meeting their unique demands while still being effective in its purpose.

After all considerations are made, some users may face obstacles not solvable by any design choice alone. Inclusivity should always be prioritized by designers when creating their products so anyone can use them comfortably irrespective of their differences or limitations, making customization essential in achieving this objective. Finally, seeking user feedback through regular testing aids designers identify areas needing improvement.

Resistance to Change

Resistance towards change is a common issue encountered by elderly individuals and those diagnosed with OCD when it comes to adopting new technology such as an energy controlling device. The fear of unknown changes or symptoms of anxiety regarding

unfamiliar technology could be some factors contributing to this phenomenon. Elders tend to have fixed routines regarding their electrical needs which make them hesitant about switching over to a new system while individuals diagnosed with OCD usually develop specific rituals around their usage that they might find hard to modify.

More importantly, providing robust training sessions along with provisioned support could do wonders in alleviating anxiety and reducing the learning curve. If the designers could cater effectively towards these concerns, they would encourage more people diagnosed with OCD as well as elderly folks to adopt this new technology thus improving energy efficiency while also cutting costs for households and safeguarding the environment. Social media adoption rates have surged significantly over recent times, finally becoming accessible across all spectrums thanks to technological advances. Reports from Statista indicate a potential three-point-one-billion active global users henceforth, promoting exceptional opportunities for companies looking forward to building stronger bonds while engaging their top tier consumer base (Statista, 2023).

In summary, the text above addresses several key aspects of designing energy control devices for various user groups, including the elderly and those with OCD tendencies. Here's a bullet list summarizing the main points:

- Privacy Concerns:
    - Acknowledges potential privacy concerns related to gathering personal data.
    - Suggests robust security features, data usage policies, and compliance with privacy regulations.
    - Emphasizes the importance of user data protection to build trust and promote greener energy consumption.

- Technical Challenges:
    - Discusses the technical challenges of creating user-friendly and customizable interfaces.
    - Highlights the need for extensive testing and research to identify user needs and preferences.
    - Addresses technical complexities related to compatibility and power management.

- Affordability:
    - Stresses the importance of affordability for broad user acceptance.
    - Proposes solutions such as government subsidies and cost-efficient manufacturing methods.
    - Aims to lower economic barriers for senior citizens and low-income individuals.

- Accessibility and Usability:

- Highlights the need to consider unique requirements and limitations of different user groups.
- Recognizes challenges related to sensory processing and visual impairments.
- Advocates for inclusive design and gathering user feedback for continuous improvement.

- Resistance to Change:
  - Addresses resistance to adopting new technology, particularly among the elderly and those with OCD.
  - Recommends providing training and support to alleviate anxiety and encourage adoption.

6.1.5 Ethical Consideration

When an application is collecting personal data and getting hold of information about the user's electricity usage, their location, and daily routines, and in this case potential concerns regarding privacy may arise. Therefore, before sharing a user's data, it is essential to obtain their consent and take necessary measures to ensure the safeguarding of their privacy.

Using an app to track electricity usage might cause a problem. This means that it could make people think that those with OCD are strange and need to be watched all the time. This could lead to unfair treatment and social discrimination. Another aspect, there is a risk if the application is not designed with sensitivity and support, as it could trigger or worsen OCD symptoms. Confusing or hard to understand energy usage data could cause anxiety and lead to obsessions over energy consumption.

Some individuals find it hard handling hardware or software to use an energy monitoring application, further exacerbating existing inequalities and disadvantages for those who lack access to these resources. Some environmental impacts have also been considered when encouraging the use of an energy monitoring application, as it could contribute to overall energy consumption and its environmental consequences.

6.2 Wide range of stakeholders

The electricity app offers both "turn on" and "turn off" functions to cater to a broad user base, including those with OCD, ensuring usability for all. This approach makes the application more versatile and user-friendly for a broader audience. Having only the "turn off" function in the electricity application is beneficial for people with OCD. This is because individuals with OCD often have compulsions related to turning things off to reduce anxiety. Excluding the "turn on" function aligns with their therapeutic needs. Simultaneously, including the "turn on" function makes the application versatile and accessible to a broader audience.

7
Conclusion

This project aimed to develop a mobile application that allows remote management of electricity usage for two specific groups: elderly individuals and those with OCD. The project followed an iterative approach: Design Thinking Process. This method focuses on understanding the users' needs and challenges at an early stage of the project. It involves generating various prototypes, testing them with the target audience, gathering feedback, and refining the prototypes iteratively until a final solution is achieved. The main goal of design thinking is to create functional and intuitive solutions that are enjoyable and effective. This approach can be applied in various fields such as innovation strategy, product design, and experience management, where it has demonstrated significant value.

Throughout each stage of the design thinking process, a variety of methodologies were utilized to guide the creative problem solving towards a clear and effective solution. These methodologies provide a structured approach to generating ideas, creating prototypes, and conducting tests. They help us stay focused and organized while exploring new concepts and improving existing ones. By following these methodologies, all relevant stakeholders were actively involved and well-informed throughout the design process, leading to more successful outcomes. Additionally, using methodologies allowed us to gain a deeper understanding of user needs and behaviors, resulting in solutions that are more empathetic, and user centered.

The use of different methodologies in the design thinking process has improved problem-solving strategies in various industries, including this project. By following a structured approach and going through various stages of idea generation and testing, we were able to develop accurate solutions. In the empathizing phase, techniques like the "Break Up Letter" and "User Observation" were used to conduct user research and better understand the needs and preferences of the elderly and those with OCD. In the defined phase, methods such as "Persona," "Storyboarding," and "Scenarios" were employed to gain deeper insights into users. The ideate phase involved “Brainstorming”, “Sketches” on paper, and creating “Low fidelity prototypes" before finalizing an idea. In the prototype phase, "High Fidelity Prototype," "Survey," and "Questionnaire" were used to further improve and refine our ideas and prototypes during the testing phase. Testing involved user “Interviews” and “Usability testing” to assess the functionality and effectiveness of our prototypes early on. It was observed that psychologists and individuals with higher academic qualifications possess stronger critical thinking skills regarding the idea of the project.

After the initial idea of creating a mobile application for managing electricity remotely for elderly individuals and those with OCD, research questions were developed for both groups. As the project progressed through the defined phase, it became clear that designing an application that caters to the specific needs of both groups would require a considerable amount of time and attention. Therefore, the decision was made to focus primarily on people with OCD and explore how the application could help alleviate their anxiety.

When designing a device dedicated to controlling and monitoring electricity consumption levels, it is important to consider numerous factors to ensure successful development. These factors include the device's ability to accurately measure electricity usage and its user-friendly interface with secure interactions through reliable encryption protocols. Additionally, the application is affordable not only for high income individuals but also for those with low incomes, and it should be able to function globally without being **limited** by geographical barriers.

7.1 Research Questions

Research Question 1:

1. What should be considered when designing a device which controls and reads electricity consumption of electric dependent technology?

When developing devices for electricity control and monitoring, several crucial factors need to be considered. **Accuracy** is important as it empowers users to make informed choices about their energy consumption. In our application, real-time data, daily cost breakdowns, and device consumption rankings are readily accessible, enabling users to manage resources efficiently and embrace an eco-conscious lifestyle. **Simplicity**, ensuring a user-friendly interface. We employ visual cues and intuitive controls, catering to users of all technical backgrounds. **Security** is essential, encompassing robust encryption and compliance with data privacy regulations to safeguard sensitive user information. **Affordability** is another cornerstone of our approach. We offer the application for free while exploring alternative revenue streams such as advertisements and in-app transactions. This ensures that our solution remains accessible to a wide audience. **Accessibility and Usability** are pivotal considerations, encompassing multilingual support and cultural sensitivities to foster global adoption.

Research Question 2

2. What are the implications of designing an energy control device for the elderly and people with OCD?

Addressing **privacy concerns** is paramount, especially for individuals with OCD. Robust security measures, including encryption and clear data usage policies, work to alleviate these concerns. **Technical challenges** include crafting a customizable, user-

friendly interface. Extensive testing and research help us understand diverse user needs, enabling us to offer an inclusive solution that caters to everyone, regardless of their technical prowess. Ensuring **affordability** for all is a key objective. This entails exploring funding options, cost-effective design strategies, and potential subsidies, making our energy control devices accessible to those with varying financial means. **Accessibility and Usability** are integral to our design approach. We consider unique user requirements, such as addressing sensory processing issues and visual impairments, ensuring that our product is truly inclusive. Regular user feedback guides our ongoing improvements. Finally, we acknowledge **resistance to change** among elderly users and individuals with OCD. We tackle this challenge by offering comprehensive training and dedicated support, ultimately encouraging the adoption of our technology. This not only promotes energy efficiency but also contributes to cost savings and environmental preservation.

In conclusion, our design prioritizes accuracy, simplicity, security, affordability, accessibility, and usability. These considerations underpin our commitment to crafting energy control devices that are effective, user-friendly, and accessible to all, fostering sustainability and eco-conscious living.

7.2 Obstacles

The project encountered a big challenge when trying to find people to test the application because OCD is a sensitive and personal disorder. People with OCD feel uncomfortable sharing their symptoms, even in research or testing situations, because they worry about privacy and discrimination. This made it hard for the developers to find volunteers with OCD who could help them create solutions for this group. The Swedish OCD association agreed to provide testers for the advanced version of the application, but nobody wanted to do interviews. They only gave feedback by leaving comments.

Another challenge they faced was promoting surveys on social media. There was not much interest, possibly because people with OCD are not continually active online and might be worried about sharing personal details with a large audience. This led to only a few people participating in the surveys.

To overcome these challenges, it could be helpful to focus on a target group that is less complicated than people with OCD. They could also involve mental health professionals and experts in user experience design to help create a good application. It is important to be sensitive to these challenges and produce unique solutions that specifically address the needs of people dealing with personal struggles like OCD.

7.3 Future Work

Creating an application for people with OCD requires understanding the intricacies of the condition, including triggers, stressors, control needs, and anxiety management techniques. It is essential to consult with experienced psychologists who have worked with

OCD patients before starting any research study. This article discusses why involving psychologists is crucial in such projects and the benefits they bring.

When creating an app for people with OCD, it's important to work together with psychologists who know a lot about this condition. Their knowledge helps us understand how OCD affects the lives of those affected and guides us in designing features that help manage symptoms. By collaborating with experts, we make sure our product follows what works best and provides a good user experience.

Furthermore, collaborating with psychologists provides guidance on identifying triggers and ensuring equal access to the app for all users, regardless of the severity of their condition. This input helps prevent potential problems and anxiety after the app's release or approval, while maintaining inclusivity as a primary consideration.

By utilizing the expertise of psychologists, the development of an OCD application can offer several advantages. Firstly, it ensures that the application effectively helps individuals manage their symptoms by incorporating effective coping mechanisms and strategies recommended by psychologists. Secondly, the input from psychologists' aids in creating an accessible and user-friendly interface for the application, reducing stress and anxiety levels while effectively addressing OCD-related concerns.

In the context of an electricity consumption app for individuals with obsessive-compulsive disorder (OCD), there is a safety issue. The current app feature allows devices at home to be turned on and off from a distance. However, this could cause unexpected issues, particularly if devices are turned on remotely while users aren't there. To make sure users are safer and their OCD-related worries are addressed, it's suggested to only let remote control turn devices off. This change makes users safer, matches what they need, and lowers the possible problems connected to using remote control to turn devices on.

7.4 Concluding Remarks

Valuable insights and feedback were obtained through the user observation method applied to both the elderly and individuals with OCD. Regarding mobile applications, both target groups expressed comfort and willingness to utilize them. A common theme that emerged from both groups was the desire for an "easy-to-use" application with a user-friendly interface that avoids unnecessary complexities. Notably, no negative comments were raised during the meetings regarding the concept of an electricity consumption application. These findings underscore the importance of designing a straightforward and intuitive interface that caters to the needs and preferences of both user groups. One of the experts specifically highlighted the importance of addressing trust issues commonly faced by individuals with OCD. This suggestion led to the idea of incorporating confirmation text when users switch appliances on or off, providing calmness and helping to ease their concerns.

Collaborating with psychologists when creating an application for individuals with OCD has many benefits. They have specialized knowledge about the condition and its varying

severity levels. Their guidance allows us to incorporate advanced features that address their concerns and identify triggers to ensure inclusivity.

Feedback from RISE played a crucial role in shaping our prototype design process. Input from subject matter experts highlighted areas needing refinement and opportunities for functional enhancement. Implementing their suggested improvements resulted in an advanced solution that maximized user satisfaction. Embracing constructive criticism is important in any development or research cycle, as advocated by industry professionals.

Our project evaluation revealed the need for further optimization to better serve the elderly community. It was important to consider their unfamiliarity with technology as an obstacle. We believe that introducing simplified features in an easy-to-use application would have enhanced their interaction with technology.

The advancing technological landscape poses challenges for elderly who may lack the necessary skills or exposure to utilize it fully. This can lead to frustration or avoidance of technology altogether among this group. To address this, we propose focusing on creating simplistic and intuitive user interfaces tailored to the needs of elderly, prioritizing clear labeling and unambiguous language.

To ensure accessibility for all users, we were conscious of specific challenges faced by elderly, such as impaired vision or hearing loss. We integrated larger fonts and high-contrast graphics to facilitate ease of use for all members of this population. Extending development efforts would have allowed us to create solutions with improved design and functionality for the elderly, prioritizing a streamlined user experience through simplified features.

We studied Swedish laws and talked to legal experts and the Discrimination Ombudsman. This helped us understand the difficulties in creating technology solutions for people with OCD. We followed Sweden's strict privacy laws but were disappointed that there weren't specific regulations for mental health apps like ours. This made us feel frustrated and uncertain about our legal situation. The research process has shown us the importance of legal systems keeping up with new technologies, especially in mental health apps. Despite worries about not having clear references for our users' cases, we will continue to prioritize ethical and legal standards while working on similar projects.

In conclusion, people with OCD may have different opinions about using apps to address their symptoms, depending on the type and extent of their symptoms. It is important to respectfully acknowledge these varied perspectives by closely collaborating with those affected by OCD to develop effective symptom management solutions.

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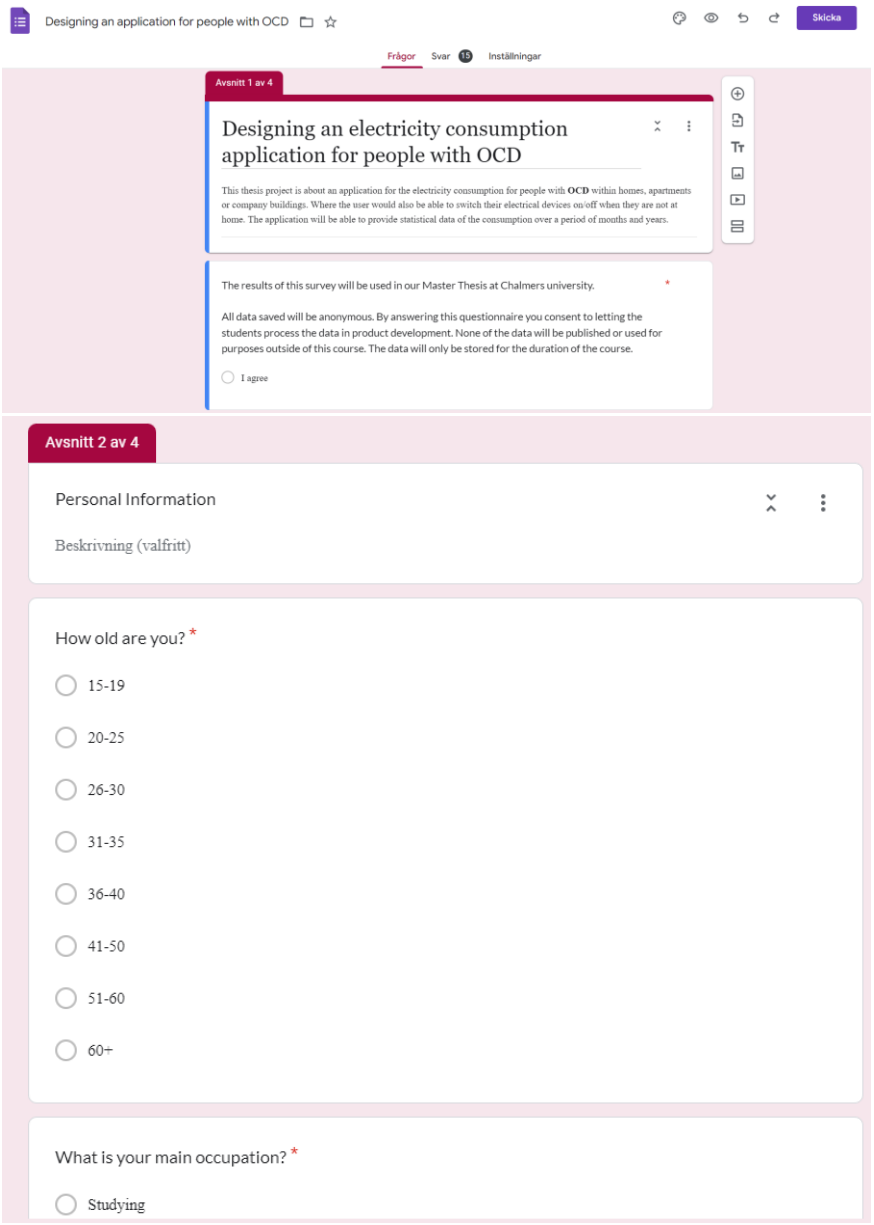
A

APPENDIX: Low-Fidelity and High-Fidelity Surveys

Appendix A.I Low-Fidelity Survey Questions



What is your main occupation? *

- Studying
- Working
- Unemployed
- Retired
- Prefer not to say

What is your gender? *

- Male
- Female
- Prefer not to answer

What is your religion? *

- Christian
- Muslim
- Muslim
- Jewish
- Others
- No religion
- Prefer not to answer

How do you live? *

- Alone
- With a partner
- With family
- Prefer not to say

What type of housing do you have? *

- Villa, terraced house (radhus)
- Apartment
- Special accommodation for OCD

Do you use technology in your everyday's live? *

- ○ Yes
- ○ No

If yes, which technology? *
(you can select more than one)

- ☐ Reminder apps
- ☐ Meditation apps
- ☐ Electricity controller
- ☐ Therapy apps
- ☐ Fitness Tracker
- ☐ Online support groups
- ☐ I answered no.
- ☐ Other technologies

Avsnitt 3 av 4

This section explains question about routins that invlove people with OCD about electricity consumption. Rate your answer on a scale between 1-5

Beskrivning (valfritt)

How often do you turn off lights when you leave a room? *

	1	2	3	4	5	
Not at all	○	○	○	○	○	Extremely

Have you ever felt compelled to repeatedly check appliances or electronics to make sure they are turned off? *

	1	2	3	4	5	
Not at all	○	○	○	○	○	Extremely

Have you ever avoided using certain devices or appliances, at the same time, to reduce your energy consumption? *

1	2	3	4	5

Have you ever avoided using certain devices or appliances, at the same time, to reduce your energy consumption? *

	1	2	3	4	5	
Not at all	○	○	○	○	○	Extremely

Do you feel anxious or uneasy if you are unable to control energy usage in your home? *

	1	2	3	4	5	
Not at all	○	○	○	○	○	Extremely

Can you trust an application that helps you control your electricity usage? *

	1	2	3	4	5	
Not at all	○	○	○	○	○	For sure

Using an application for electricity usage feels *

1	2	3	4	5

Using an application for electricity usage feels *

	1	2	3	4	5	
Unsafe	○	○	○	○	○	Safe

Using an application for electricity usage feels *

	1	2	3	4	5	
Impractical	○	○	○	○	○	Practical

Efter avsnitt 3 Fortsätt till nästa avsnitt ▾

Avsnitt 4 av 4

Low Fidelity prototype

The link for the prototype: shorturl.at/amIP9

In our prototype you can choose one of the task to do:

- 1- Turn off the cooker hood
- 2-Check the spot price today
- 3- Listen to a meditation record
- 4- Check your current home status

PS: This is a non functional prototype, which means the features doesn't really work

what task did you do? *

- ( ) Turn off the cooker hood
- ( ) Check the spot price today
- ( ) Listen to a meditation record
- ( ) Check your current home status
- ( ) I didn't do any task, I just wanted to check the whole application

After trying our low-fidelity prototype, what are your thoughts? *

Lång svarstext

Do you have any advice about how to improve the application? *

Lång svarstext

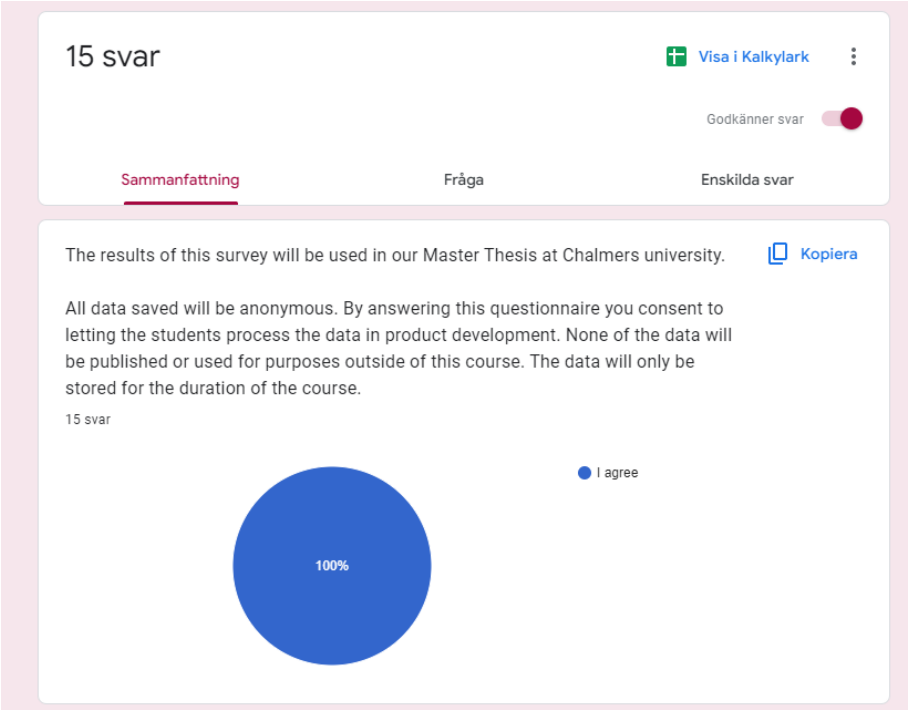
Are you intressted to participate in our high fidelity testing which will probably take place on Zoom, please write your email to contact you. *

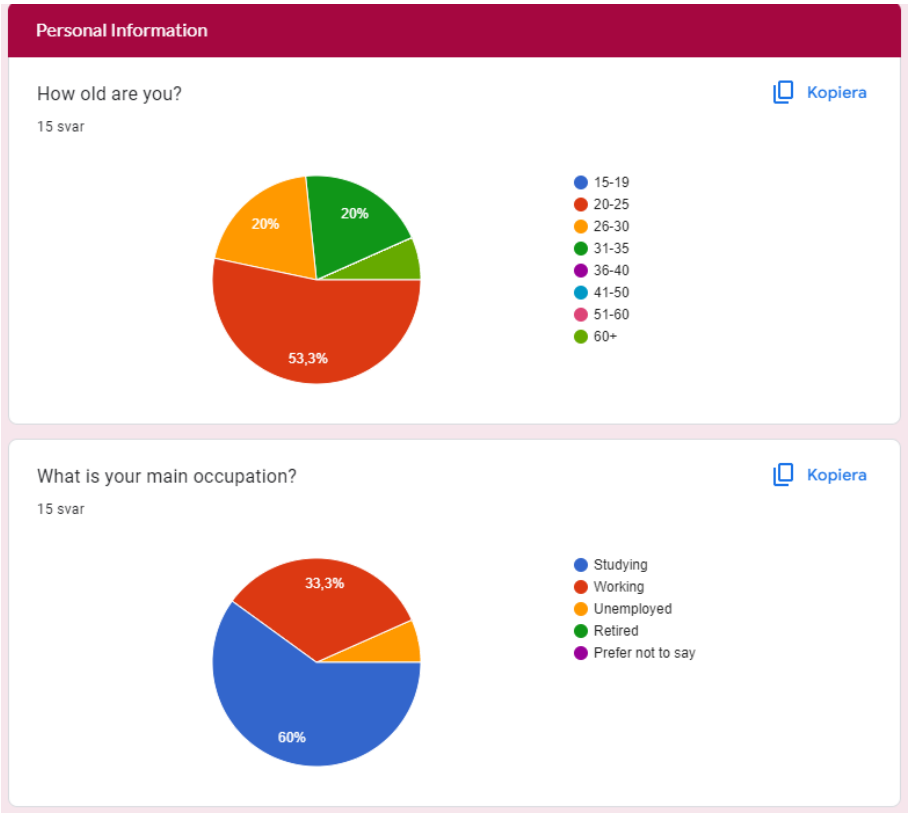
Kort svarstext

Thank you for your contribution! If you have any other thoughts please write them below.

Kort svarstext

Appendix A.II Low-Fidelity Survey Answers





What is your gender?

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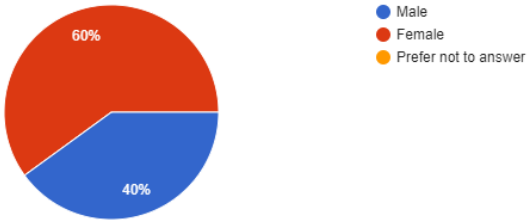

What is your religion?

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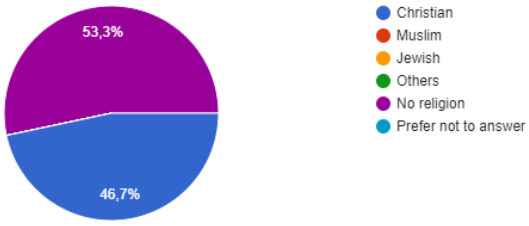

How do you live?

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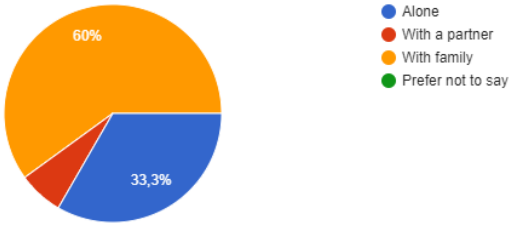

What type of housing do you have?

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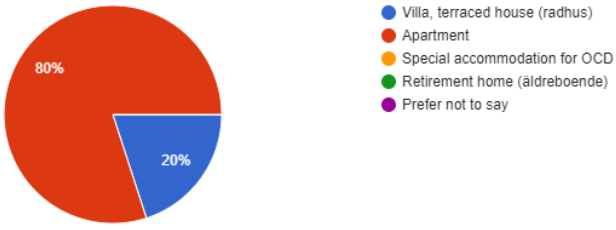

Do you use technology in your everyday's live?

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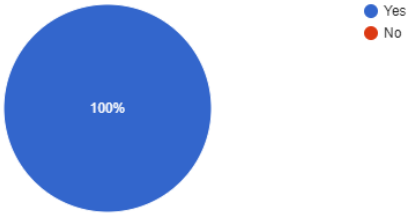

If yes, which technology?
(you can select more than one)

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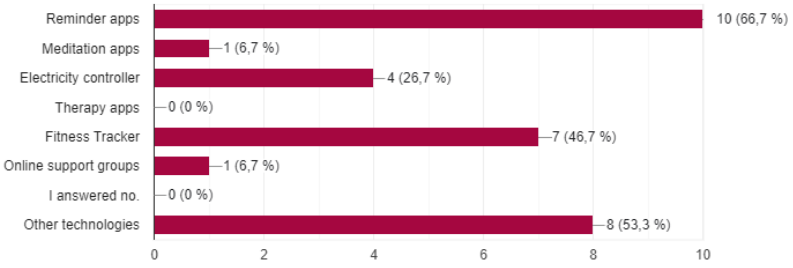
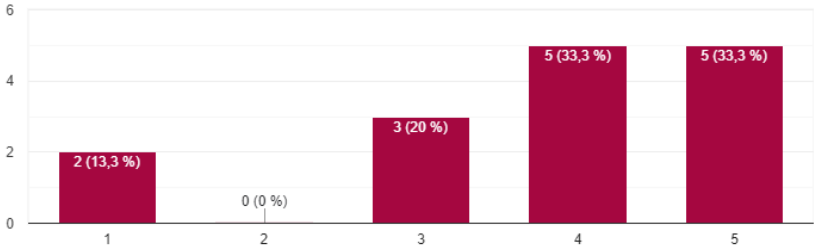


This section explains question about routins that invlove people with OCD about electricity consumption. Rate your answer on a scale between 1-5

How often do you turn off lights when you leave a room?

Kopiera

15 svar



Have you ever felt compelled to repeatedly check appliances or electronics to make sure they are turned off?

Kopiera

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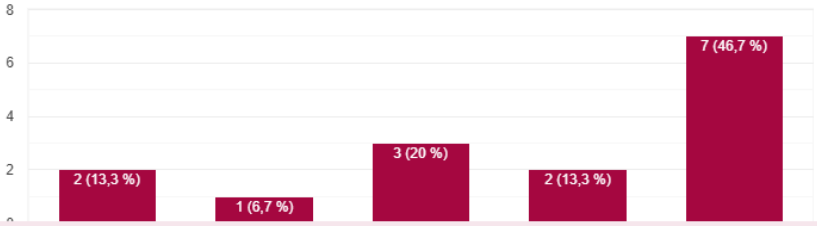

Have you ever avoided using certain devices or appliances, at the same time, to reduce your energy consumption?

Kopiera

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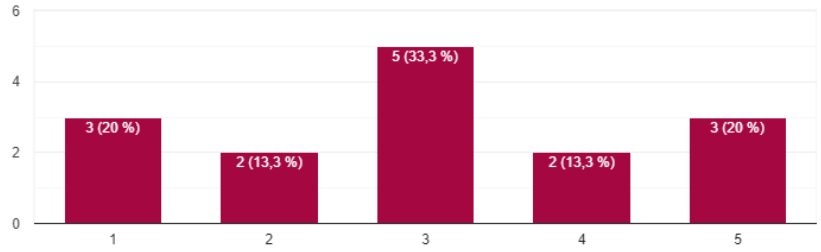
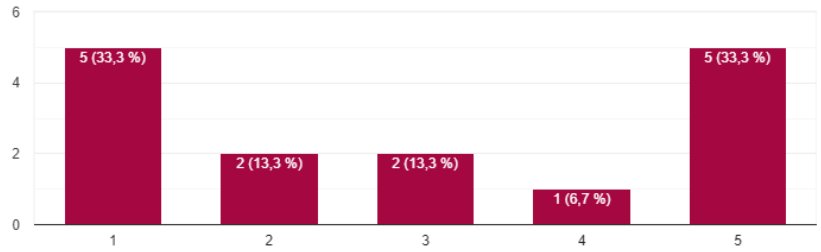


Do you feel anxious or uneasy if you are unable to control energy usage in your home?

Kopiera

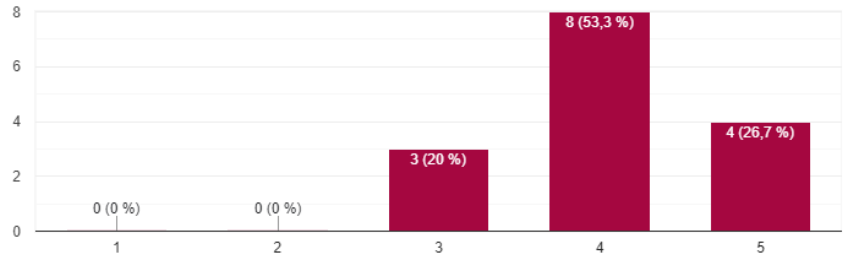
15 svar



Can you trust an application that helps you control your electricity usage?

Kopiera

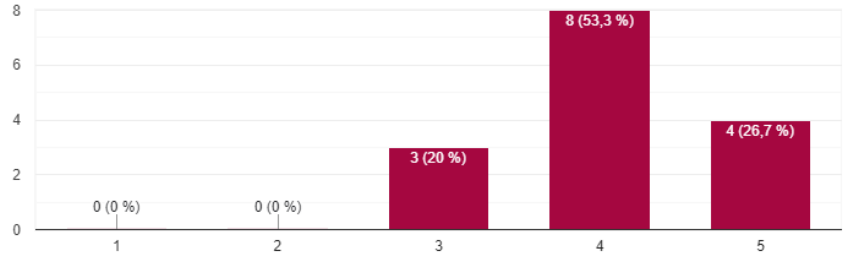
15 svar

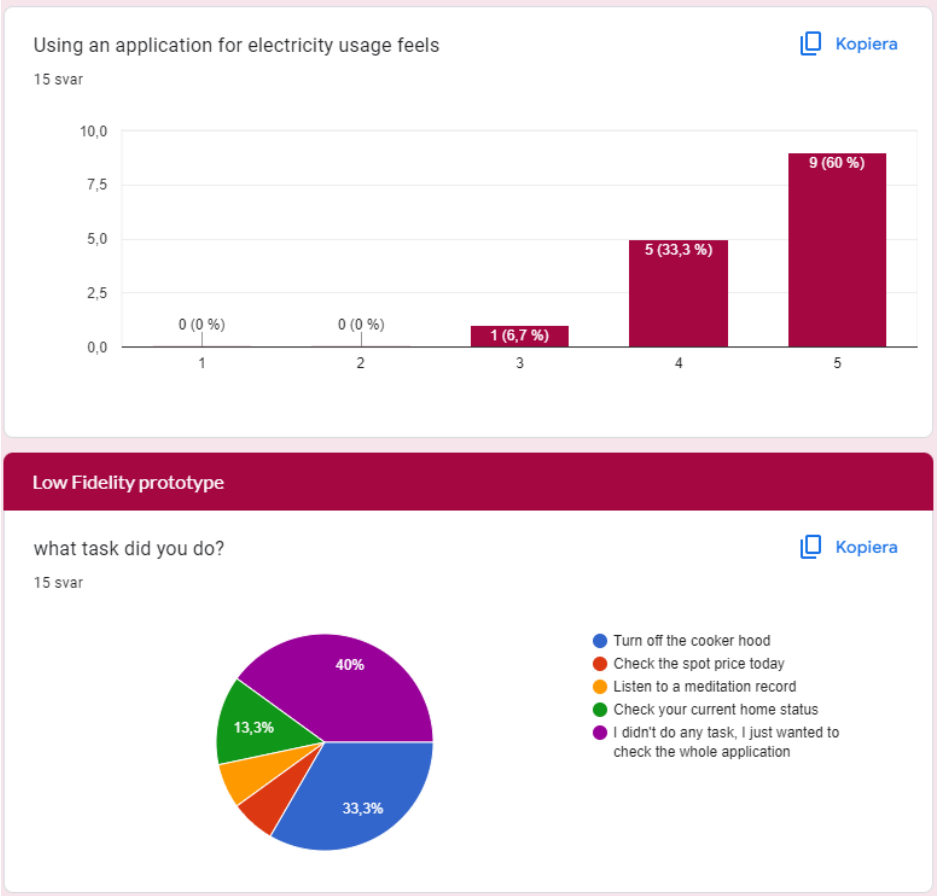


Using an application for electricity usage feels

Kopiera

15 svar



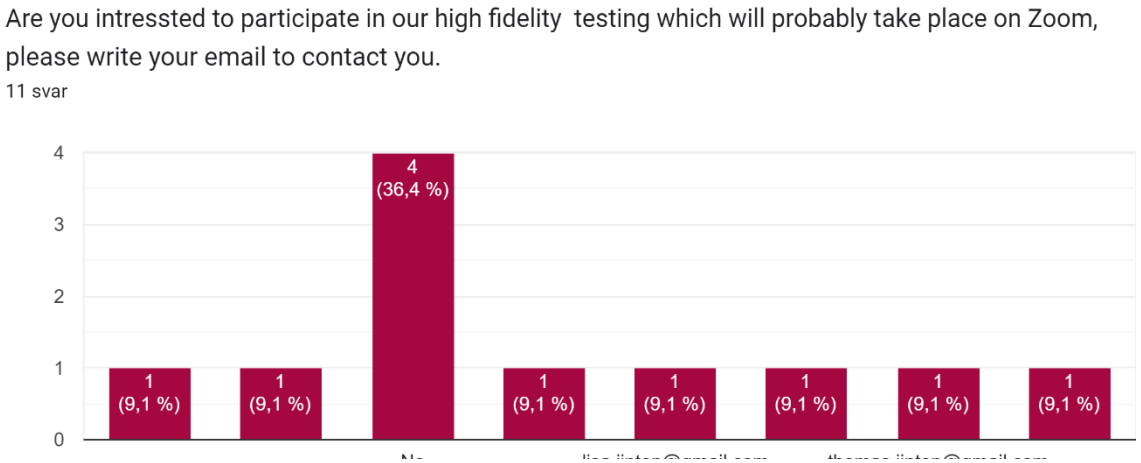


After trying our low-fidelity prototype, what are your thoughts?Good idea

"It is user-friendly"
"Verg good app for me"
"No"
"Well structured application and good functions and buttons. I like the names for the buttons and texts".
"Free therapists seems unlikely. I would want to be anonymous if I this was an application for people with OCD; I dont have to advertise the fact that I have OCD. Why does the app need so much information about me? Why a picture? Is it a social media, or an electricity app? What does the app bring that Smart Plugs dont already offer? See Verisure for example, but there are many others which already offer the ability to turn off electricity."
"An app for monitoring electricity consumption month by month (or per day, hour or any other time unit that the app user could choose). would be extremely helpful for me in my struggle to reduce the energy consumption."
"I like the design, very user friendly , but no colors were applied, felt little depressed with the layout."

“It is very practical”
“Very good”
“Simple to use, feels like im in control of my home”
“Unclear what to use it for specifically, why can I call Dr John? Perhaps I'm a bad test person since I'm not motivated or interested in using an app for controlling my electrical consumption. I prefer to always turn off things when they are not in use at home, and as such I don't see a need for looking at an app to keep track of it, especially when I live in apartment, maybe If I lived in a big house. But then I would just prefer things to be turned off automatically twhenever they are not in use.”

Do you have any advice about how to improve the application?
“No”
“-“
“It is perfekt”
“When coming to the screen for controlling electricity I do not understand why I have to click on add room to get a view of the kitchen and bathroom, should they not already be visible? That would make it more clear for me and easy to navigate.”
“More focus on what is reasonable. Free therapists probably is not reasonable. Also, what makes this app specifically for people with OCD? This seems useful regardless of OCD or not.”
“I lookes simpe enough but a posibility to change view from monthly to weekly, daily or consumption per hour would be nice.”
“no”
“to check the electrycity price per houre and to control every electrical thing in the house”
“Not at the moment”
“Perfekt”
“If its possible, show what devices consume the most electricity, and hint at them for the user to know which devices they might want to use less”
.



Thank you for your contribution! If you have any other thoughts please write them below.

“Sadly I could not access the prototype. Also might be worth mentioning my OCD is not at all related to turning lights on and off.”
“Fun to interact with the low-fidelity prototype.”
“People with OCD need to "face their fears" in order to overcome them. If possible, add possibilities for people to exercise refraining from checking electricity, perhaps? Or give them tasks that involve turning on the electricity sporadically, without their knowledge, so they have to suffer through the anxiety it would produce, in order to decrease how much anxiety they suffer in the future, maybe.”
“Thank u”

For the low-fidelity survey:

The age:

- 53.3% between 20-25 years old
- 20% between 26-30 years old
- 20% between 31-35 years old
- 6.7% 60+ years old’

The occupation:

- 60% studying
- 33.3% working
- 6.7% unemployed

The gender:

- 60% female
- 40% male

The religion

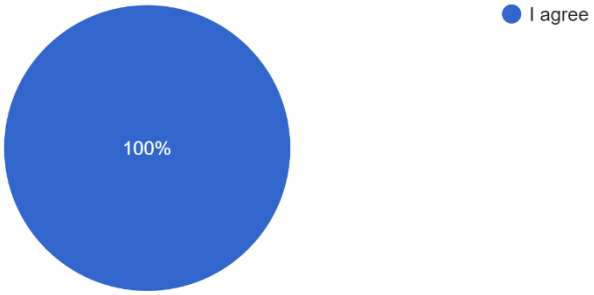
- 53.3% no religion
- 46.7% Christian

And 100% of the participants use technology in every day’s live.

Appendix A.III High-Fidelity Survey Answers

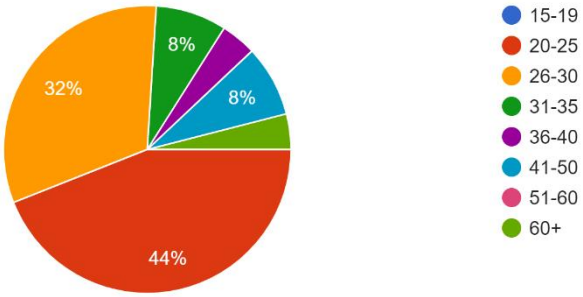
The results of this survey will be used in our Master Thesis at Chalmers university. All data saved will be anonymous. By answering this questionnaire y...ill only be stored for the duration of the course.

25 svar



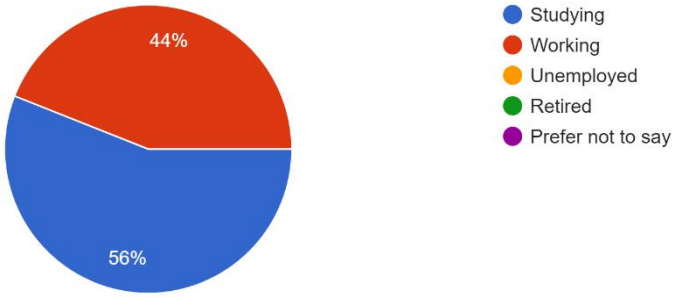
How old are you?

25 svar



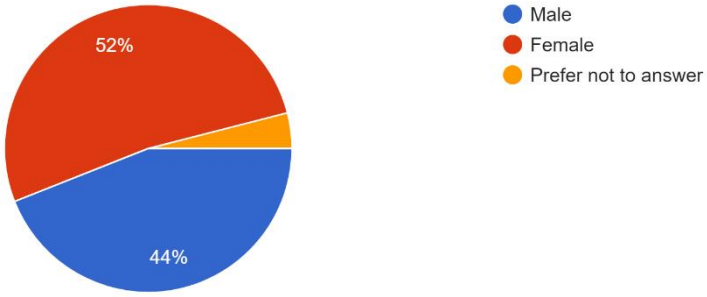
What is your main occupation?

25 svar



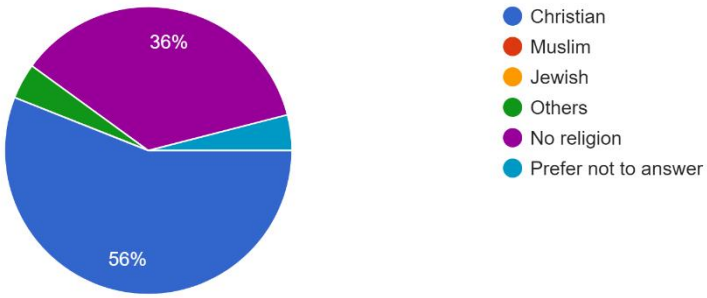
What is your gender?

25 svar



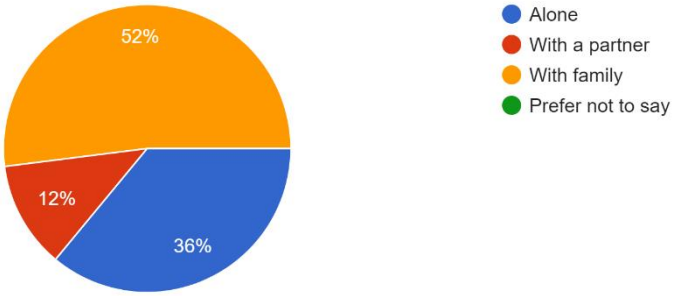
What is your religion?

25 svar



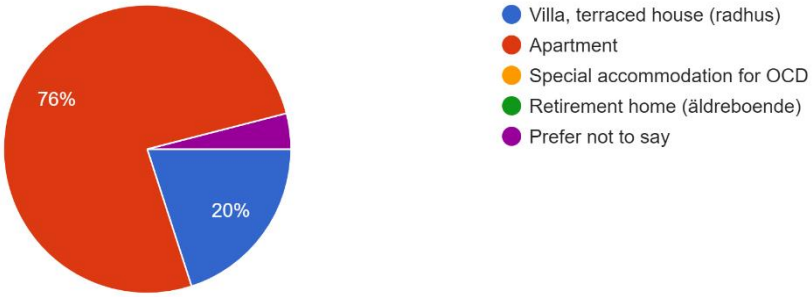
How do you live?

25 svar



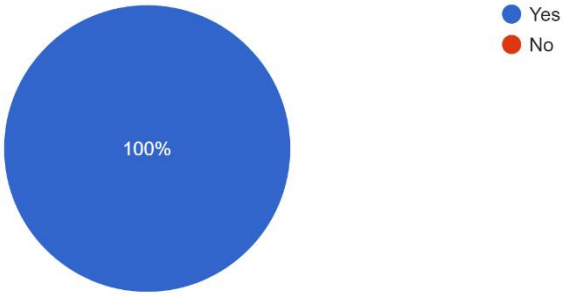
What type of housing do you have?

25 svar



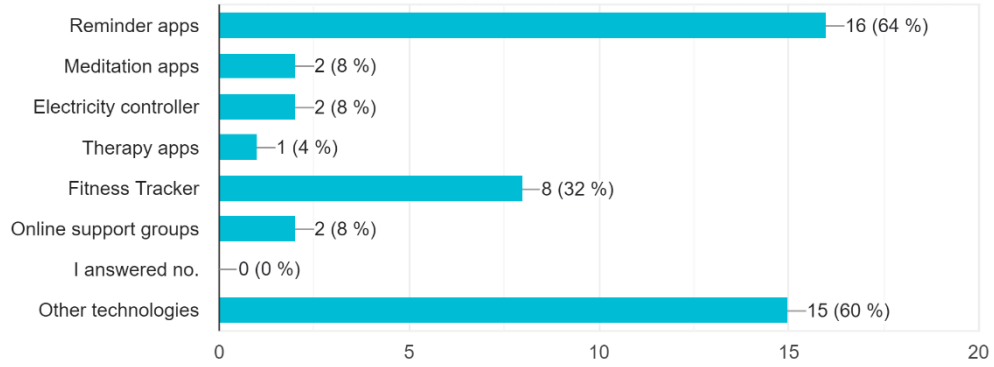
Do you use technology in your everyday's live?

25 svar



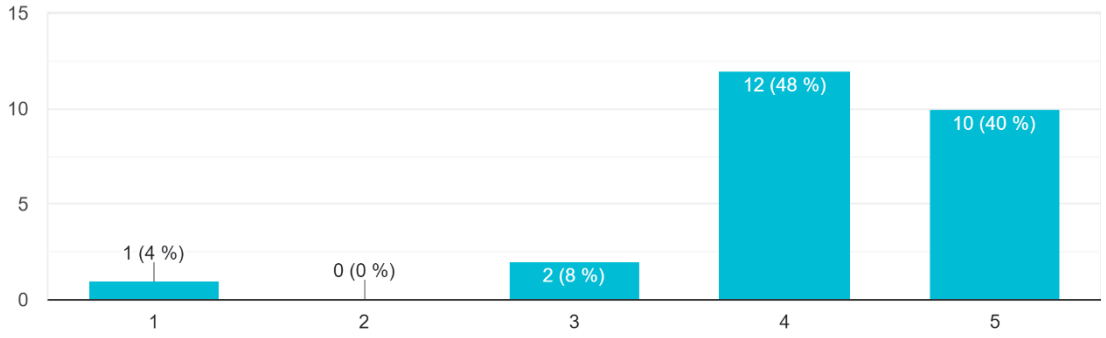
If yes, which technology? (you can select more than one)

25 svar



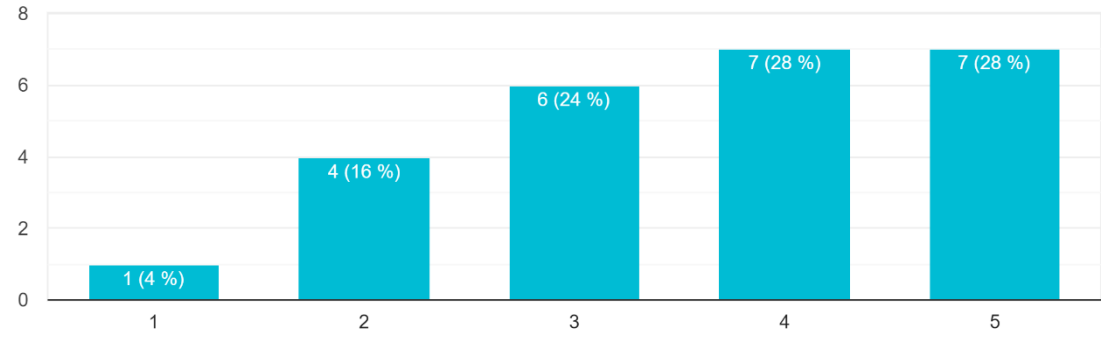
How often do you turn off lights when you leave a room?

25 svar



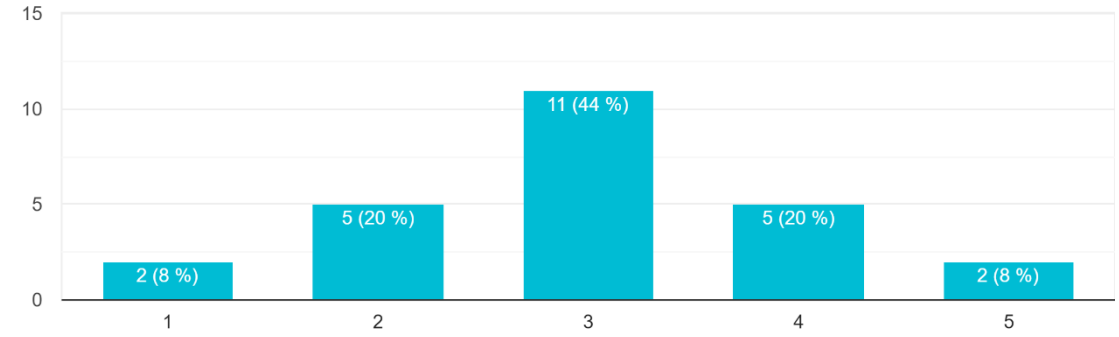
Have you ever felt compelled to repeatedly check appliances or electronics to make sure they are turned off?

25 svar



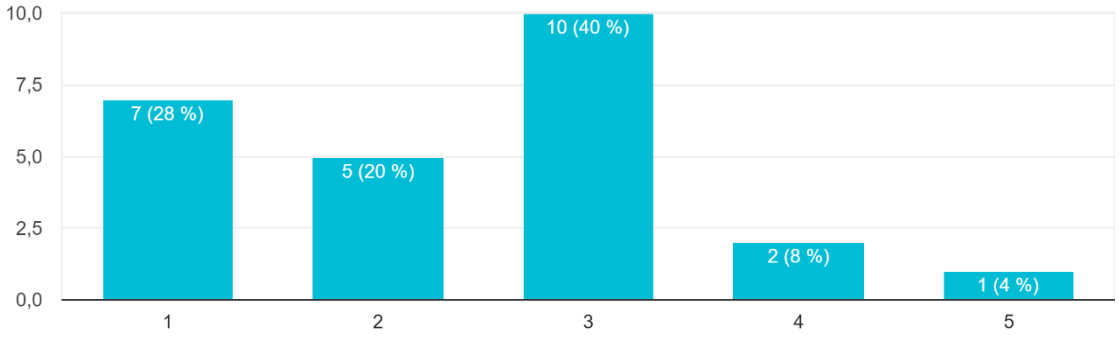
Have you ever avoided using certain devices or appliances, at the same time, to reduce your energy consumption?

25 svar



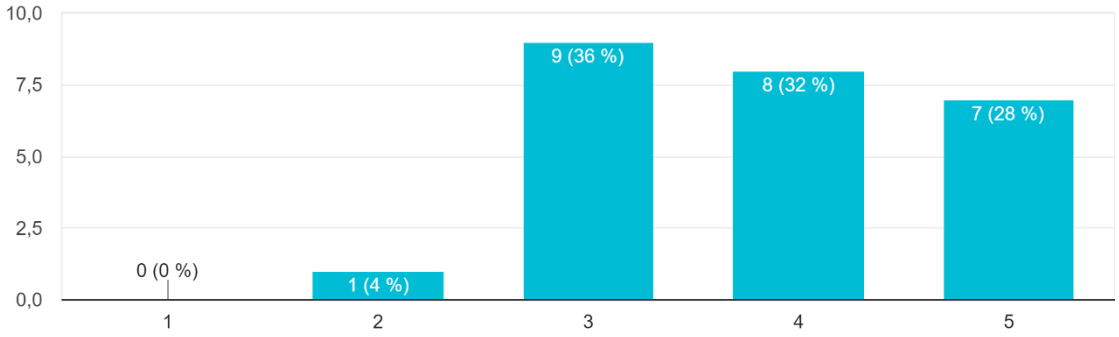
Do you feel anxious or uneasy if you are unable to control energy usage in your home?

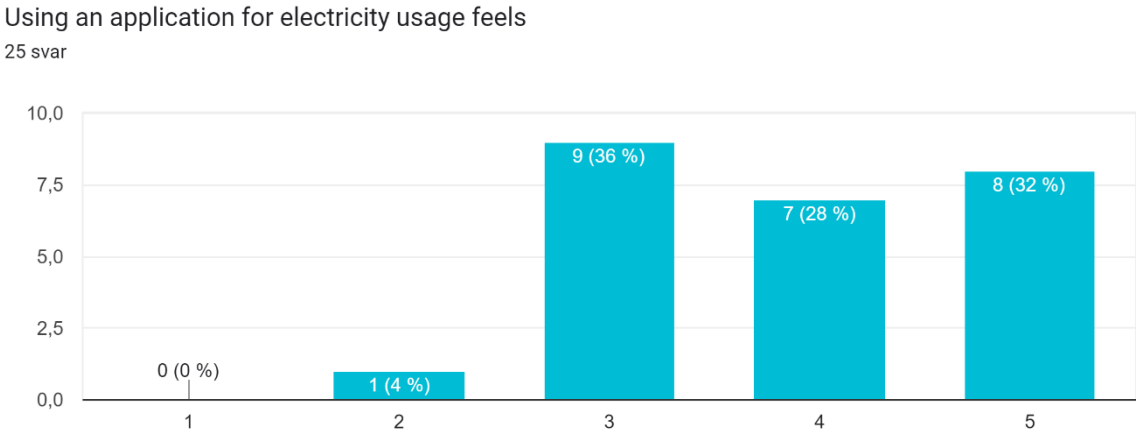
25 svar

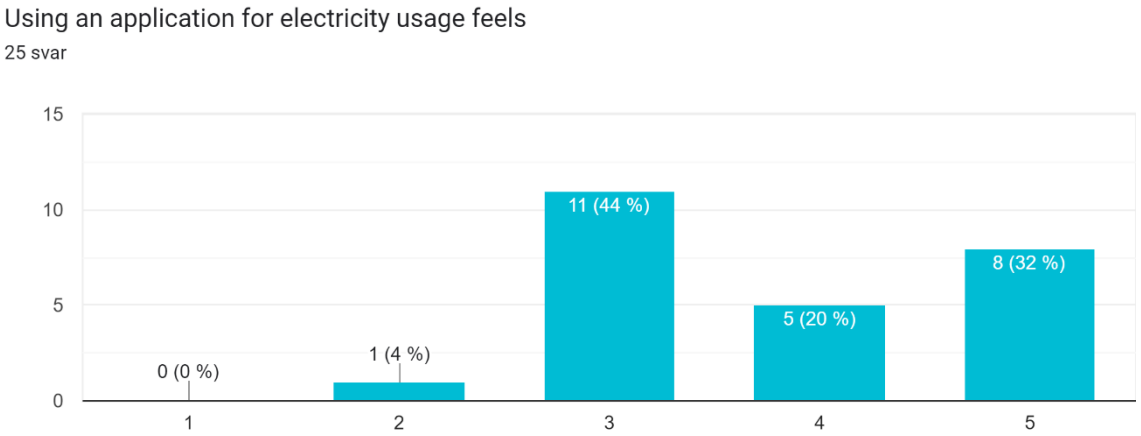


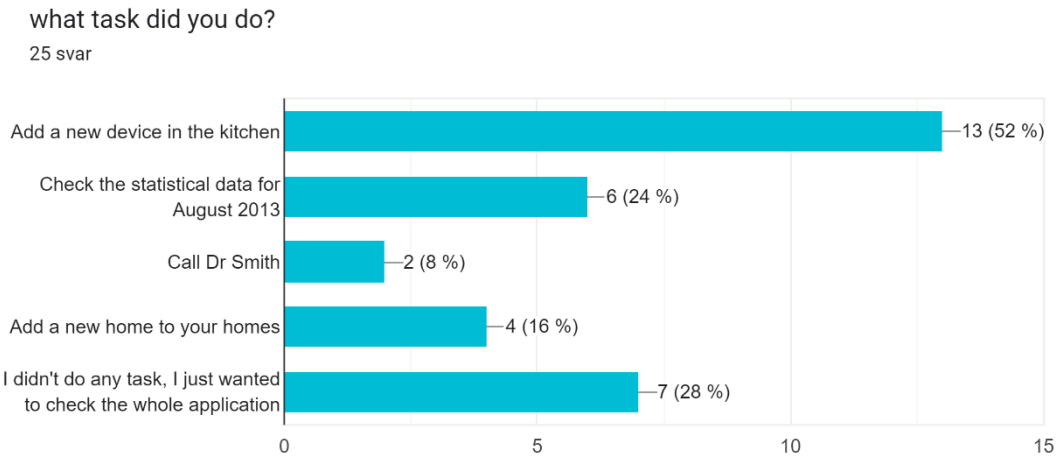
Can you trust an application that helps you control your electricity usage?

25 svar









After trying our High-fidelity prototype, what are your thoughts?

"Your high fidelity prototype was amazing and very helpful!

“I like the layout and the design, very proffesional , the colors are peacfull
“Add new home should be home page maybe. And scan new device should be at the top of the list and not at the bottom. Maybe make add new device a different look/design so it looks different from the devices and stand out.
“I could not enter
“Very practical
“I didn't choose a ”task” because I didn't understand the purpose and idea behind the choice.
“Needed a further explanation.
“Good idea. Especially when electricity is very expensive
”Ingen kommentar
”Lätt att använda, bra med notiser uppe
“It would help me a lot knowing how much energy it’s being used every day.
“It was pretty, im unsure if i would trust it to turn of the my stove though.
“I like how simple and efficient the prototype is. I like the colors and the styling of the design elements.
“It looks good, I do not really understand if the therapy tab is meant for talking with therapists or just other people or if its just a messaging app?
“Looks nice
“This is good and useful
“It was reliable
“Dont know
“It felt nice and easy to use
“Not sure
“good app that i can hv a try
“Interesting
“I like it and think its useful!
“I like how easy to add new device in the kitchen by just scanning it
“I had a hard time navigating. I guess it was because it is a prototype and not the concept and design itself. I'm also wondering if the idea is that you always turn applications on and off using the app? What if not everyone in the household has a phone? Could you only turn it on and off using the app? Could it be a security risk if you lose your phone and someone else finds it and then say turn on the oven? What is the connection to OCD? I think it is a really good idea and application to keep track of how much electricity you use and on what though.
“It´s very useful to check the monthly consumption. Next month you want to consume less energy! It´s like a competition :).

Do you have any advice about how to improve the application?

“No”
“No, everything was perfect!”
“no”
“Add some sort of reward at the end of each month when someone has saved energy, either by getting tokens or by giving them information like "this month you have saved this much energy which equals to this much *ex watch tv for 10 hrs/this much money*", because then

you get positive feedback and feel good and can visualize how much you have saved and how helpful the app is."
"Not yet"
"Same answer as above."
"Maybe being able to put timers on devices"
"Ingen kommentar"
"Den är jättebra"
"A feature I think would make bigger difference would be like a plan for improving the personal usage of electricity. In this plan we users can choose a monthly goal for our usage and then this app would notify us when to turn off different devices to reach that goal.
"Add small lines of text that explain stuff, i was a little confused"
"The carousel for the different rooms I thought was difficult to understand that it is a carousel. Perhaps with some arrows at each end of the items to make it clear that I can scroll from left to right and also some black thin borders to seperate the carousel from the other items on the screen."
"I think the tabs of the different rooms should maybe be smaller and all in 1 window, because if you often needs the kid room for example you always have to scroll far"
"-"
"Add more functions"
"No advice"
"Control on every kitchen devices"
"Not really"
"na"
"should be possible to run on computer home i use app to control lights, I wish that the app send me notice if the lights are on more than a specific time that I choose."
"I didn't really understand the switch at the bottom called "Turn of all". Does it turn on everything if it is activated? Maybe make that clearer? Make the connection to OCD and having psychologists in the app more obvious? Or just remove the part with psychologists and just keep it as a tracker app."
"The application did not really work."

Thank you for your contribution! If you have any other thoughts please write them below.

"No"
"no"
"i like this idea for OCD"
"I would like to have a explanation of "OCD" because I don't have an idea what the abbreviation stands for. It would maybe also be easier to answer the questions for people who might know "OCD". Good luck!"
"I like how it looks for the phone but maybe I want to do this on my computer as well so would the interface be very different?"
"N/A"
"Good luck."
"Nice job! It looks good. I like the colours and styling. :). "

The age:

- 44% between 20-25 years old
- 32% between 26-30
- 8% between 31-35
- 8% between 41-50
- 4% between 36-40
- 4% 60+ years old
-

The occupation:

- 56% studying
- 44% working

The gender:

- 52% female
- 44% male
- 4% preferred not to say.

The religion

- 56% Christian
- 36% No religion
- 4% preferred not to answer.
- 4% Others

And 100% of the participants use technology in every day live.

Link to the high fidelity prototype:
https://www.figma.com/proto/VgKdQatIA582jTLbmoQXSP/Master-Thesis?type=design&node-id=217-740&scaling=min-zoom&page-id=0%3A1&starting-point-node-id=217%3A740&show-proto-sidebar=1

B

APPENDIX Interviews

Interview person 1:

We would like to have an interview with you about an electricity consumption application. We will start by asking you some basic questions, and then we will let you test our app and then solve two tasks of the following: Is it okay to share some of the data?
YES or NO

YES

We will start off by asking some easy question about yourself:

1. How old are you

I'm 23 years old but turning 24 this summer.

2. What is your current occupation?

My current occupation is a part-time job at Volvo, but I'm also a full-time student

3. Do you have a religion?

No, I don't believe in something

4. What type of housing do you have?

I live in villa

5. How comfortable are you with technology? Would you be willing to use an app to help monitor your electricity consumption?

I mean comfort yes, maybe not trusting it 100%

6. What challenges do you face in controlling your electricity consumption?

Well.. I often find myself spending a lot of time and mental energy on making sure that all of my appliances and electronics are turned off and unplugged. While this can be helpful in reducing my electricity consumption, it can also be challenging to manage because it can be time-consuming. Additionally, I may experience intrusive thoughts or doubts about whether I've turned off a particular appliance or whether I've checked everything thoroughly enough, which can lead to more and more anxiety and stress. Overall, while my OCD can be helpful in promoting energy conservation, it also presents its own unique challenges when it comes to managing my electricity consumption.

7. Have you ever tried to reduce your electricity consumption? If so, what methods did you use?

I am very aware of the importance of reducing my electricity consumption and have tried several methods to do so. One thing I do is to always make sure that all of my appliances and electronics are turned off and unplugged when not in use. I also try to minimize my use of energy-intensive devices like air conditioners or space heaters.

8. What features would you like to see in an application that helps you monitor and reduce your electricity consumption?

I would like to see an application that is easy to use and provides real-time feedback on my electricity usage. Ideally, the application would allow me to set specific goals for reducing my consumption and provide reminders or alerts when I am approaching my usage limits. It would also be helpful to have a feature that allows me to track my usage over time and compare it to previous months or years. However, as someone with OCD, it's important to me that the application doesn't create additional stress or anxiety. For example, if the application

were to constantly remind me of my usage or present me with too much information at once, it could actually be counterproductive. Overall, I think an application that balances ease of use with useful features and minimal stress would be most effective.

9. Do you feel that your electricity consumption is under your control, or do you feel like it is something that is difficult to manage?

I am very aware of my electricity consumption and take steps to manage it as best I can. However, at times it can be difficult to feel like I have complete control over it. For example, I may experience intrusive thoughts or doubts about whether I've turned off a particular appliance or whether I've checked everything thoroughly enough, which can lead to additional anxiety and stress. Additionally, while I try to be mindful of my usage and use energy-saving methods whenever possible, there are times when I may need to use more energy, such as during extreme temperatures or when using energy-intensive equipment.

10. Do you think an app that helps you establish and track your electricity usage goals would be helpful in reducing your anxiety related to electricity usage?

As someone with OCD, I believe that an app that helps me establish and track my electricity usage goals could be very helpful in reducing my anxiety that's related to my electricity usage. Having a specific goal to work towards and being able to track my progress in real-time would provide a sense of control and help me feel more confident in my ability to manage my electricity consumption.

11. How comfortable would you be sharing your electricity usage data with the app and using it to track your progress towards energy-saving goals?

12. Are there any specific challenges related to your OCD or mental health that you think an app could help you overcome when it comes to managing your electricity consumption?

http://shorturl.at/dyzH7

Now **Choose one the tasks**

Here is some tasks, choose one or more to do

- 1- Add a new device in the kitchen
- 2-Check the statistical data for August 2013
- 3- Call Dr Smith
- 4- Add a new home to your homes

1. After trying our high-fidelity prototype, what are your thoughts?

I liked your app but what if I forgot my mobile at home, what if someone stole my phone could they open then app and turn on everything, can they easily see all my data?

2. Do you have any advice about how to improve the application?

finger print to the app everytime i go in?, i like the design of your app

---

Interview person 2:

We would like to have an interview with you about an electricity consumption application. We will start by asking you some basic questions, and then we will let you test our app and then solve two tasks of the following: Is it okay to share some of the data?
YES or NO

Yes

We will start off by asking some easy question about yourself:

1. How old are you

Im 29

2. What is your current occupation?

I work as preschool teacher

3. Do you have a religion?

Mmm, is the question obligatory?

4. What type of housing do you have

I live in a small apartment, in Hisingen.

5. How comfortable are you with technology? Would you be willing to use an app to help monitor your electricity consumption?

I have mobile, and I'm using applications that are easy and pleasant.. but to be honest I don't really know if it is a good idea to have this kind of app

6. What challenges do you face in controlling your electricity consumption?

I repeatedly check my appliances, especially the oven. The first thing I do when I come home is check if I forgot something on. .

7. Have you ever tried to reduce your electricity consumption? If so, what methods did you use?

no not really to be honest

8. What features would you like to see in an application that helps you monitor and reduce your electricity consumption?

As I said before I don't really like the idea of applications So I can't answer the question

9. Do you feel that your electricity consumption is under your control, or do you feel like it is something that is difficult to manage?

it is difficult to manage.. but in some way it is under control since i'm not consuming electricity a lot.

10. Do you think an app that helps you establish and track your electricity usage goals would be helpful in reducing your anxiety related to electricity usage?

As I said before I don't really think it would be a brilliant idea.. I feel that this would trigger my stress about my control needs.

11. How comfortable would you be sharing your electricity usage data with the app and using it to track your progress towards energy-saving goals?

I don't know how comfortable I would be.. the main thing here is about the anxiety and the stress not the energy saving and its goal.

12. Are there any specific challenges related to your OCD or mental health that you think an app could help you overcome when it comes to managing your electricity consumption?

minimize my anxiety I hope

We let the tester try our app in a few minutes…
http://shorturl.at/dyzH7

Choose one the tasks

Here is some tasks, choose one or more to do

- 1- Add a new device in the kitchen
- 2-Check the statistical data for August 2013
- 3- Call Dr Smith
- 4- Add a new home to your homes

Well, nice app firstly. I enjoyed trying it. I called dr Smith and everything was very smooth, but I didn't like when I called dr smith the page popped out and that made it less credible. And the chatt function I didn't really like, felt like messenger and whatsapp although it was anonymous. Just have a simple button like you called it, therapy and have the list of your therapist.
I remembered something: You can add a schedule function to schedule an oven or a lamp.
I liked the idea of the notification, and I really enjoy the intrevju

1- After trying our high-fidelity prototype, what are your thoughts?
2- Do you have any advice about how to improve the application?

Interview person 3:

We would like to have an interview with you about an electricity consumption application. We will start by asking you some basic questions, and then we will let you test our app and then solve two tasks of the following: Is it okay to share some of the data?
YES or NO

No

We let the tester try our app in a few minutes…

We will start off by asking some easy question about yourself:

1. How old are you

I just turned 23

2. What is your current occupation?

I am studying first year in university, and i dont work

3. Do you have a religion?

i wouldn't say i have a religion because i don't practice any, but i do believe that there is something like with bigger power

4. What type of housing do you have?

i am currently living in an apartment with my parents

5. How comfortable are you with technology? Would you be willing to use an app to help monitor your electricity consumption?

okey first i like basic technology but not when it get to complicated, because then iT makes anxious because i dont what to click on a wrong button then something bad happens, about having an application uhm i think i depends, if it's 100% reliable then it would be good i think, but if that's not the case then it would give me more stress and anxiety because then i would think that i made my electricity consumption worse.

6. What challenges do you face in controlling your electricity consumption?

I went to a fire training once and one of the things they said was that dust in some places with electricity can cause fires and it made me very stressed because I had never thought about it, so from that day I dust all of those places every day to feel more safe

7. Have you ever tried to reduce your electricity consumption? If so, what methods did you use?

no i have actually never, but I switch off wherever no one is and always make sure I've turned off the stove, straightener and so on so i guess that reduces my electricity consumption . I often and often check my devices specially if i use the straightener or other heat devices

8. What features would you like to see in an application that helps you monitor and reduce your electricity consumption?

a little bit of what I was up to before, like having someone confirm that a certain thing or device is turned off or a checklist that you can design yourself in a creative way in the app that should describe the routines you usually do like before you leave your home

9. Do you feel that your electricity consumption is under your control, or do you feel like it is something that is difficult to manage?

i don't really have a good answer to that, because it depends on how i feel

10. Do you think an app that helps you establish and track your electricity usage goals would be helpful in reducing your anxiety related to electricity usage?

i think yes if it works 100 percent, and I can trust and have tested many times before

11. How comfortable would you be sharing your electricity usage data with the app and using it to track your progress towards energy-saving goals?

i don't really know because i think i could be little personal, and i would be questioning the app and maybe not trust it to 100 %

12. Are there any specific challenges related to your OCD or mental health that you think an app could help you overcome when it comes to managing your electricity consumption?

different checklist that i could design however i want and have different categories like one for each room, and also with a reminder like " did you turn off this or that"

Choose one the tasks

http://shorturl.at/dyzH7

Here is some tasks, choose one or more to do

- 1- Add a new device in the kitchen
- 2-Check the statistical data for August 2013
- 3- Call Dr Smith
- 4- Add a new home to your homes

1- After trying our high-fidelity prototype, what are your thoughts? i like that there is space for adding new devices it makes it more personal,
2- Do you have any advice about how to improve the application? nothing that comes up to my mind right now

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